



panorama

Isotope Ratio
Mass Spectrometry

Panorama - Ultra-High Resolution IRMS

Unique ion optic design for high resolution studies with high sensitivity

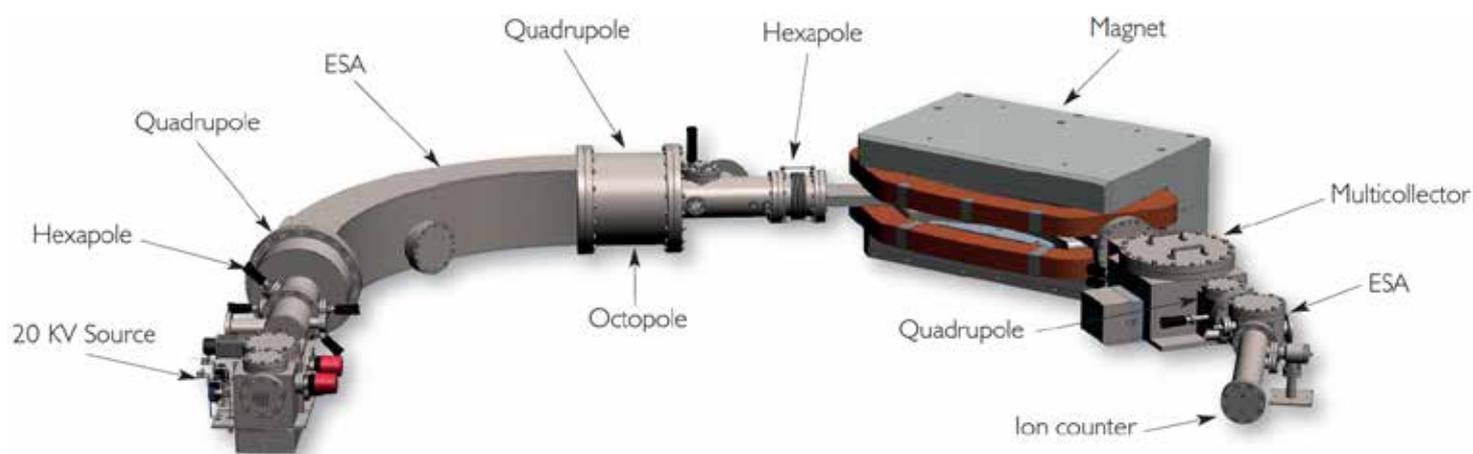
The Panorama is an entirely new ultra-high resolution multiple collector mass spectrometer specifically designed to undertake stable isotope analyses, far exceeding the performance of other commercial instruments.

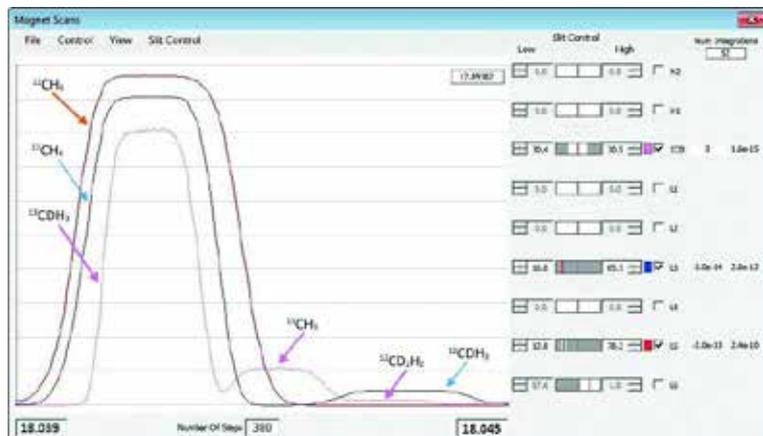
The Panorama, takes a completely different ion optic approach to other instruments, and is based on the ESA - Quadrupole - Magnet design of Matsuda. Optimised for ultra-high resolution studies, whilst maintaining high sensitivity, this design uses a magnet of 800mm radius, and has been shown to resolve all the methane peaks at mass 18amu, to permit the first truly sub permille measurement of, not only $^{13}\text{CH}_3\text{D}$, but also $^{12}\text{CH}_2\text{D}_2$. The mass dispersion / magnification figure of merit for this instrument is 1400mm.

The design used employs a 1017.6mm radius, 72.5° electrostatic analyser, followed by an electrostatic quadrupole and 800mm radius, 85° magnet. Electrostatic aberration correction devices to correct for (for example) beam rotation and curvature are also fitted.

The Ion Source

The source of the Panorama is designed to operate at up to 20kV, rather than the 10kV of other offerings. This gives rise to an increase of effective source sensitivity, as more of the produced ions are transmitted through the optics of the instrument. An extra differential pumped compartment is provided before the (fully adjustable) mass spectrometer entrance defining slit, to ensure the pressure inside the mass spectrometer remains at the lowest possible value under all conditions (especially continuous flow). This dual chamber source region is pumped by two 300l/sec turbo pumps, whilst the dual inlet itself is pumped using a 75l/sec turbo. The mass spectrometer analyser region is pumped using ion pumps and is isolated from the source region by a high vacuum pneumatic valve.



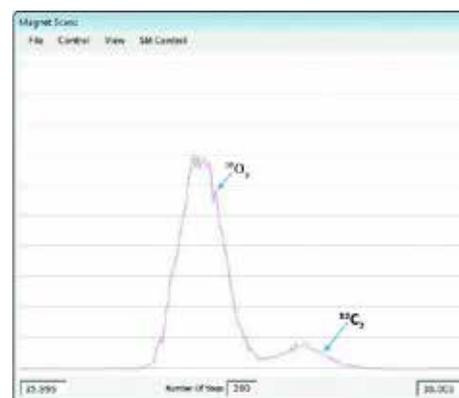
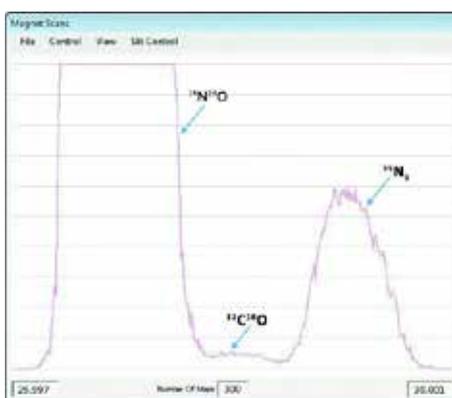


Methane 18amu spectrum

Versatile Adjustable Collector Slit Technology

The collector features eight independent movable collector sledges and one fixed (“axial”) collector. Six of the collectors are located on the low mass side of the “axial” collector, and two to the high mass side. All nine collectors are fitted with fully adjustable collector slits, operated by the proven Nu Instruments “hot wire” technology. This allows isotopologue studies to be undertaken, in full resolution mode.

The multi-collector mass spectrum shown above is from a sample of methane. Axial, L3 and L5 collectors are used to acquire data of nominal masses m/z 18, 17 and 16 respectively. In the example shown the collectors are optimised to measure the specific species of $^{13}\text{CDH}_3$, $^{13}\text{CH}_4$ and $^{12}\text{CH}_4$ simultaneously. The combination of superior mass resolving power and variable collector slits enables the Panorama to resolve interfering isobaric species, simplifying data analysis. Sample spectra from other species are shown above.



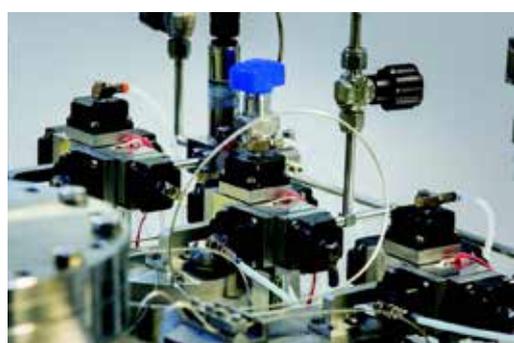
Detectors

The axial collector is fitted with both a Faraday and ion counting detector, either of which may be selected. This enables minor peaks to be studied, below the level of Johnson noise of the Faraday preamplifiers. This technique has been employed down to ~200cps in the case of the minor $^{12}\text{CH}_2\text{D}_2$ species. Since large dynode electron multipliers are used, the devices do not exhibit the short lifetime, or poor peak shape, of smaller devices.



Dual Inlet

The inlet system of the Panorama consists of two “dual inlet” assemblies (giving four bellows assemblies). Any can be assigned to the sample or reference, by the software. Two inlet pressure transducers are supplied, one dedicated to the block fitted with the smallest bellows (normally employed as the “sample” inlet) and the other to monitor the other inlet pressures. A manual valve is used to isolate the continuous flow inlet from the two dual inlet changeover valves.



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Innovators in Mass Spectrometry



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geochemistry



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