

# *nu plasma II*

MULTI-COLLECTOR ICP-MS



*nu instruments*



## Nu Plasma II

The Multi-Collector ICP Mass Spectrometer has become an important analytical tool as a rapid means of determining isotopic abundance in both liquids and solids. The Nu Plasma II is a double focussing magnetic sector instrument, designed to provide the best possible precision and accuracy for simultaneous isotopic ion detection. The instrument utilises a unique, patented, variable dispersion ion optical Zoom lens enabling the simultaneous measurement of the isotopes of elements from lithium to uranium on its static collector array of sixteen Faraday detectors and up to six ion-counting electron multipliers. Ground potential analyser operation provides ease of access, serviceability and excellent reliability. With its high precision, accuracy, reliability, upgradability and flexibility, the Nu Plasma II represents a major advancement in Multi-Collector ICP technology, making it the instrument of choice for Geological/Earth Science, Environmental Science, Biochemistry, Biomedical Science and Nuclear Science laboratories.



## Nu Plasma II - key features

- Double focussing high precision isotopic measurement mass spectrometer
- Sixteen Faraday detectors, each with a 55V dynamic range
- Up to six large discrete dynode ion-counting multipliers
- High abundance deceleration filters available for individual ion-counting multipliers
- Enhanced variable Zoom Optics for maximum flexibility
- Compact torch box design with an externally mounted sample introduction system
- Enhanced pumping configuration
- High resolution and pseudo high resolution capabilities
- Ground potential analyser operation
- Bespoke software with full monitoring of all instrument parameters
- Compatible with third party accessories
- Low cost of ownership
- Lifetime technical support



# Nu Plasma II

## MULTI-COLLECTOR ICP MASS SPECTROMETER





## Mass Spectrometer

The Nu Plasma II incorporates a double focussing forward geometry Nier-Johnson analyser with an Electrostatic Analyser followed by a laminated magnet. The forward geometry is essential for simultaneous detection of multiple ion beams. Ions are both energy and direction focussed. A novel variable dispersion ion optical arrangement enables all masses to be located in the centre of the Faraday collectors of a fixed static array.



## Source

The Nu Plasma II source uses a proprietary solid-state 2kW RF generator operating at 27.12MHz. RF matching and tuning of the torch box is software controlled, providing simplicity and reliability of the matching system. The cones are manufactured from high purity nickel for optimal analytical and sensitivity performance. Alternative platinum and platinum tipped cones are also available. A comprehensive range of glass, quartz, and PFA spray chambers, nebulisers and semi-demountable torches are available to suit all analytical needs. The source is fully compatible with alternative sample introduction devices such as desolvation nebuliser systems, laser ablation, hydride generation systems, gas chromatographs as well as allowing full integration with third party auto-samplers.



# Nu Plasma II

## PROVEN HIGH PERFORMANCE ANALYSER

### Variable Dispersion Ion Optics

The Nu Plasma II utilises a unique Zoom Optics system that removes the necessity for employing adjustable collectors. This greatly increases the reliability of the collector array and allows instantaneous switching between collector configurations. Only this patented design maintains the instruments double focussing geometry as the zoom is altered.

### Collector System

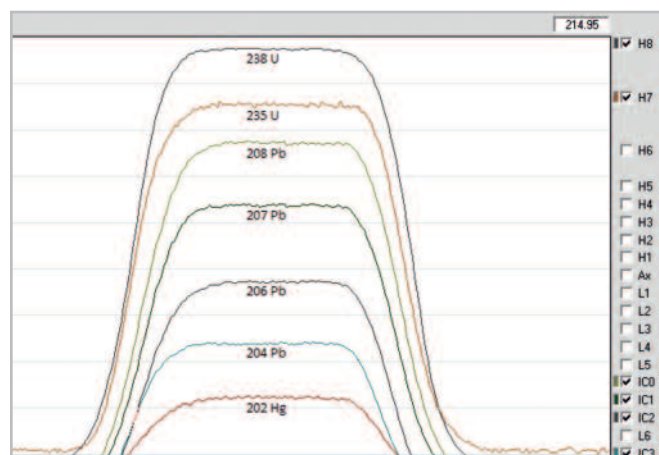
Sixteen Faraday detectors are fitted to the instrument as standard, providing the ultimate in flexibility for simultaneous measurements of all isotope systems. The unique fixed Faraday collector array incorporates both electrostatic and magnet suppression devices to prevent the escape of ions and electrons from the Faraday detector. The ceramic Faraday detectors have been field proven (for over ten years) with no sign of performance loss.

### Vacuum System

The Nu Plasma II utilises the latest generation of vacuum pumps for ultimate performance and reliability, ranging from the large  $80\text{m}^3\text{h}^{-1}$  rotary vane pump for the plasma interface to the UHV turbo-molecular pumps on the analyser section. Suitable vacuum gauges are fitted throughout the system, including the analyser, with full vacuum monitoring within the Nu Plasma II software.

### Analyser

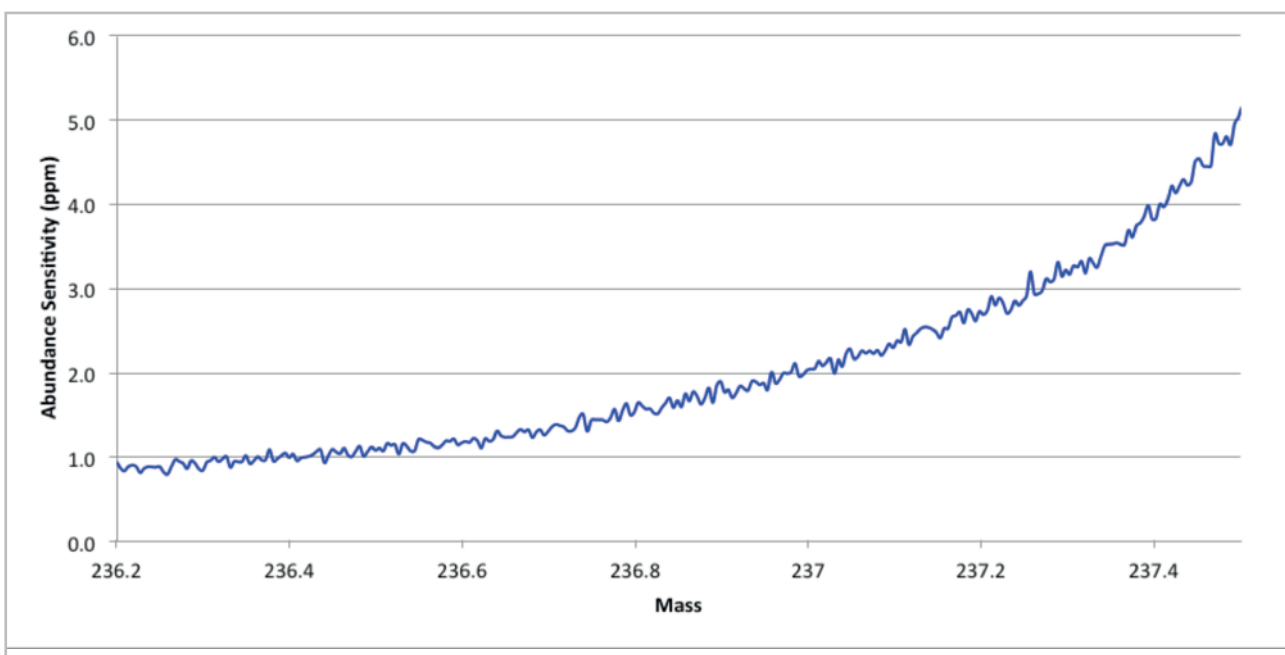
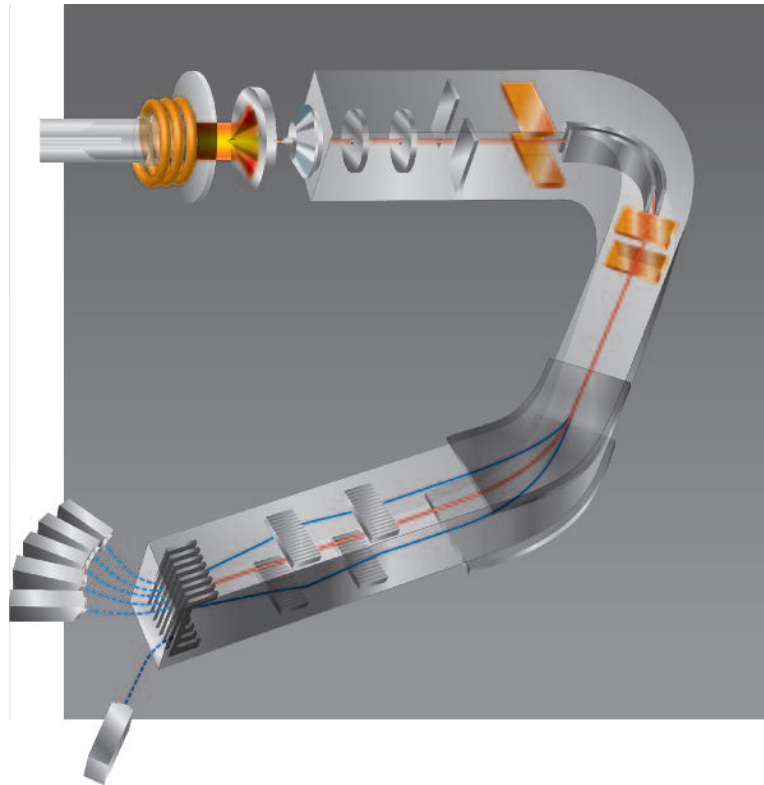
The original Nu Plasma was the first multi-collector ICP-MS instrument to utilise ion pumps to pump the analyser, relying on efficient differential pumping to reduce the gas load from the atmospheric pressure source to manageable levels. Calculations however shows that, with recent advancements in instrument sensitivity, the argon ions transported on the ion beam itself can now dominate over the neutrals. To maintain the ultra-high vacuum specification required for many applications, the Nu Plasma II incorporates turbo molecular pumping of the analyser section. This results in the exceptional abundance sensitivity performance of the Nu Plasma II of  $<3\text{ppm}$  at  $-1$  amu spacing relative to  $^{238}\text{U}$ . Only by utilising such efficient pumps is it possible to ensure the abundance sensitivity doesn't degrade as sensitivity increases.



Peak scan of mixed lead/uranium isotopes, Faraday detectors & multipliers

### Multiple Multipliers

Up to six ion-counting multiplier channels can be interspersed within the Nu Plasma II collector array providing the ultimate flexibility and performance required for current and future applications, from simultaneous measurement of low level boron, U-Pb for geochronology studies to isotopic measurements of trace actinides for nuclear forensics. All of the multipliers used within the Nu Plasma II collector are of a full size, discrete dynode construction to ensure that the best stability, linearity, lifetime and noise performance are achieved.



Abundance Sensitivity Trace of low energy  $^{238}\text{U}$  ions

# Nu Plasma II

## HIGH MASS RESOLVING CAPABILITY

An interference free, flat-top peak is essential for precise and accurate isotopic measurements. The High Resolution features of the Nu Plasma II achieve high mass resolving power across the entire multi-collector array, by permitting the separation of analyte peaks from polyatomic interferences, providing a large, interference free, flat-top peak area. This is achieved by reducing the widths of the source slit, alpha slit or sometimes the collector slit. The Nu Plasma II offers two types of high resolution capability: *Pseudo High* resolution and *High* resolution.

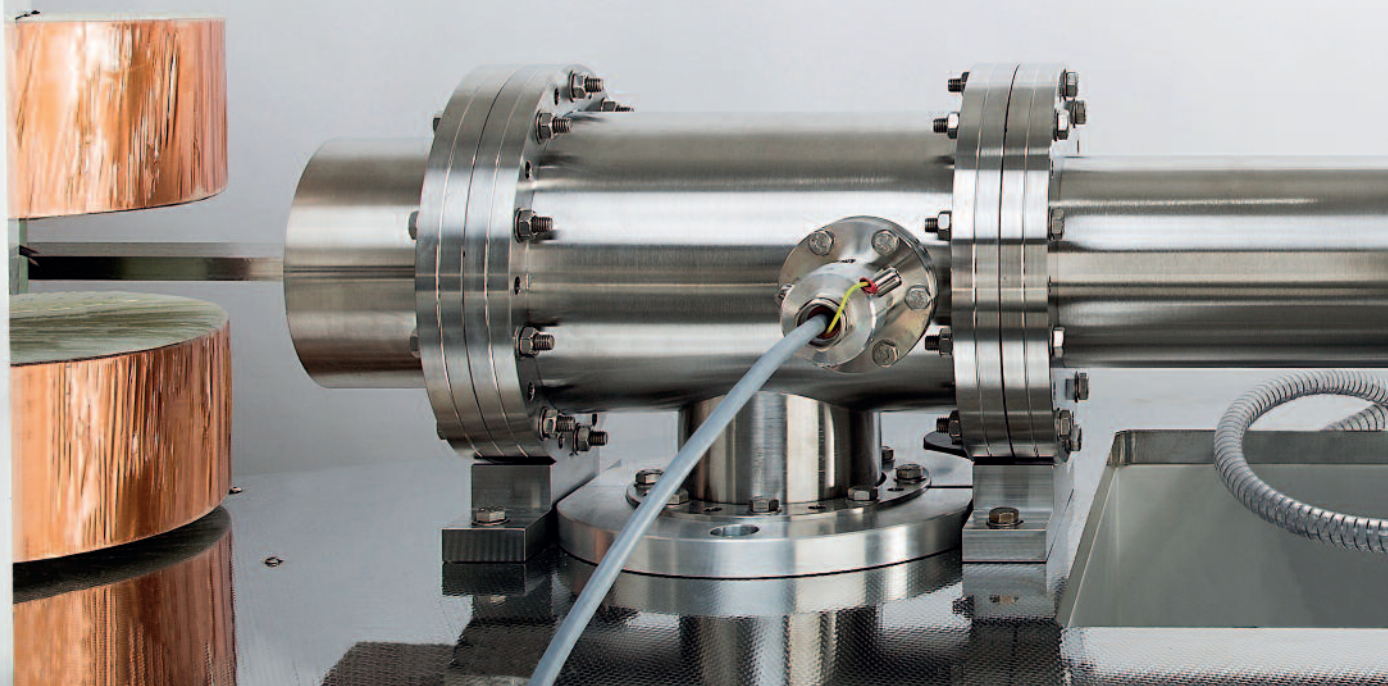
### Pseudo High Resolution

The *Pseudo High* resolution method partially resolves peaks, leaving a flat-topped section of resolved peak for isotopic ratio measurements.

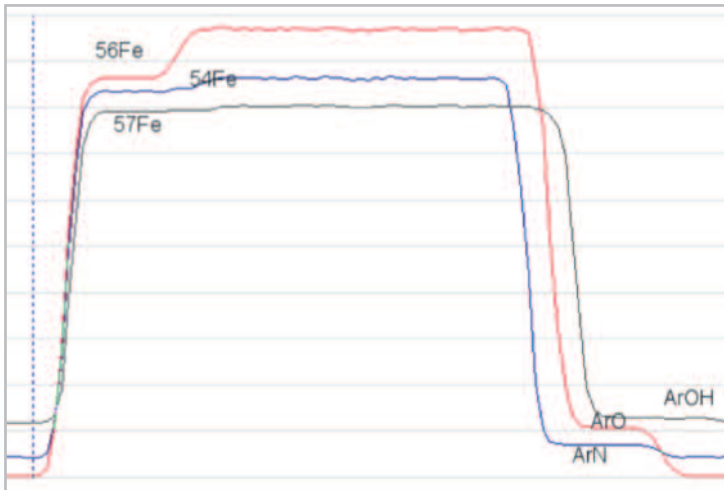
This is achieved by reducing the width of the source defining slit, using a selectable slit mechanism and then reducing the width of the alpha slit located before the ESA to enhance the peak shape by reducing any image aberration. This technique works as long as the interferences are all on the same side of the peak.

### High Resolution

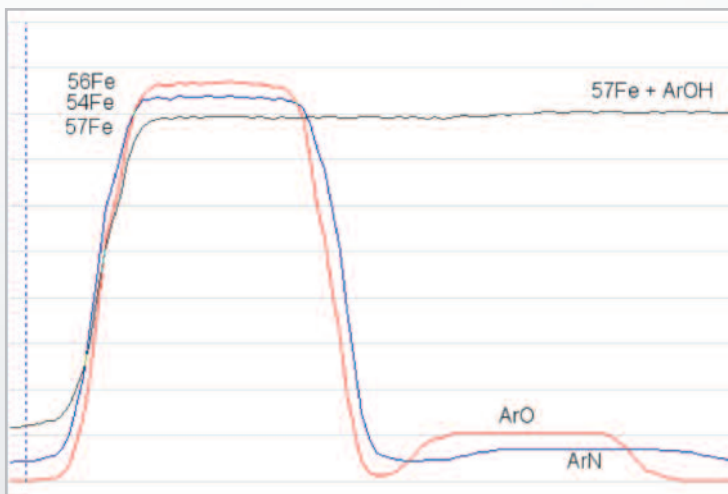
For applications where interferences appear on both low and high mass sides of the analyte, the high resolution method should be used. The unique design of the Nu Plasma II fixed collector system makes it possible to obtain full resolution from interferences by changing the collector slit widths, without having to replace collectors. This method allows the user to observe the complete resolution of interfering peaks from analyte peaks without reducing the sensitivity any further compared to *Pseudo High* resolution.



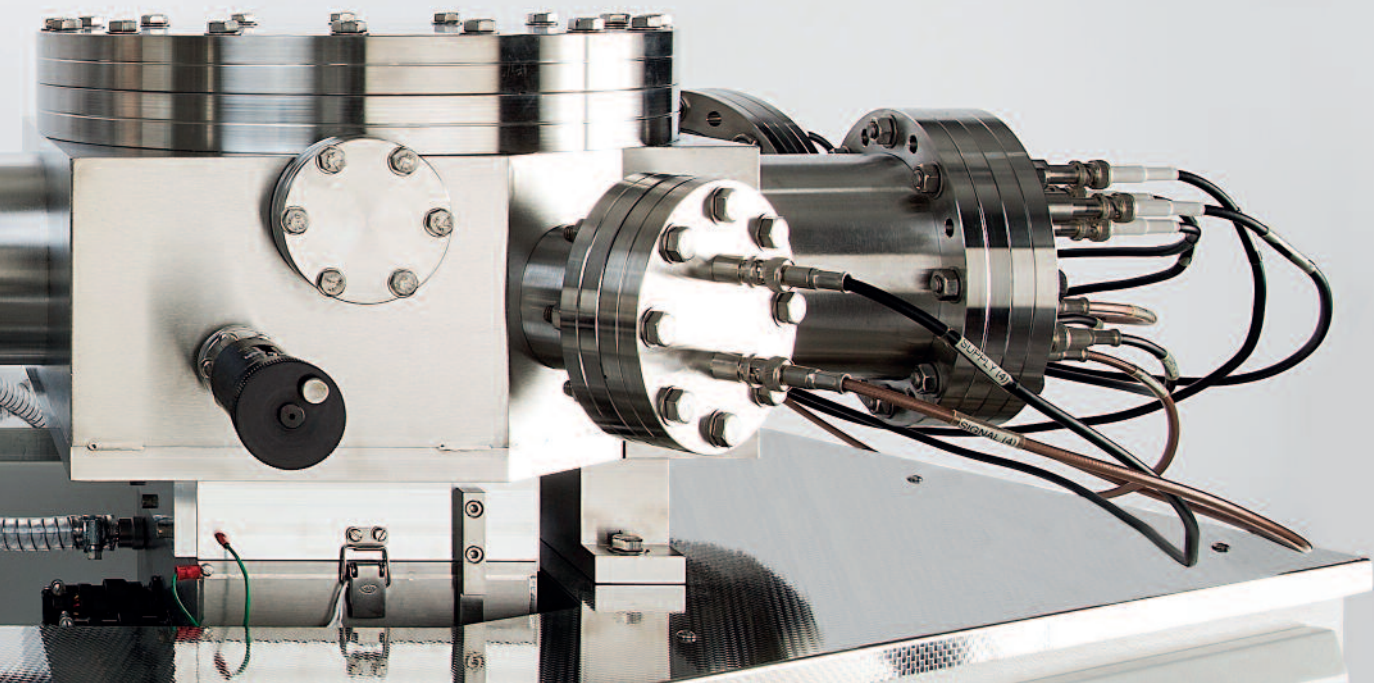




*Iron isotopes resolved from their respective interferences in the Pseudo High resolution mode using the 50  $\mu\text{m}$  source defining slit.*



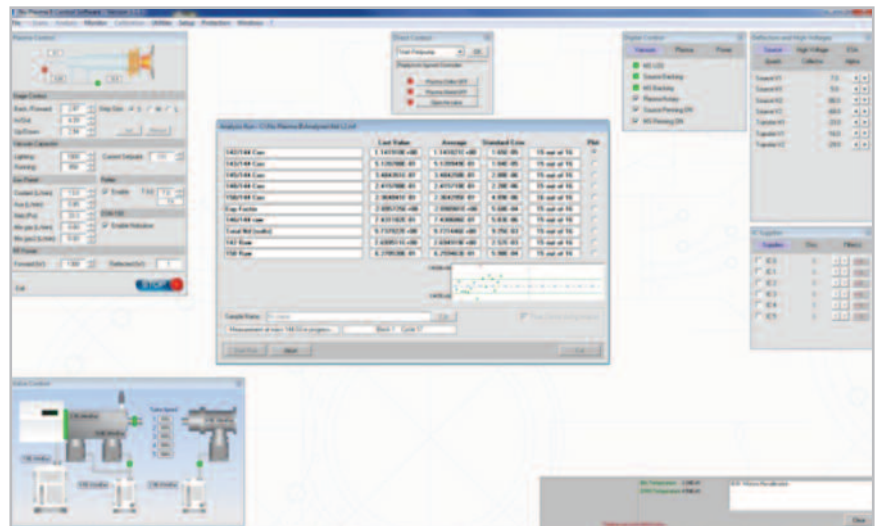
*Iron isotopes separated from their respective interferences with  $^{54}\text{Fe}$  and  $^{56}\text{Fe}$  fully resolved using the adjustable collector masks.*



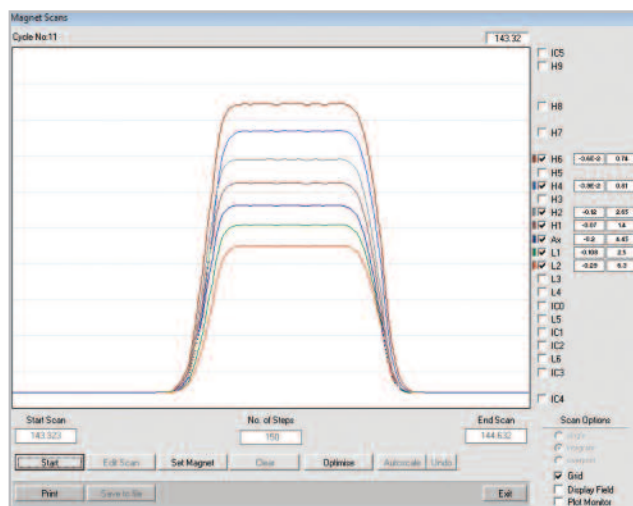
# Nu Plasma II

## BESPOKE AND INTUITIVE SOFTWARE SUITE

The Nu Plasma II comes with a software suite, which gives the user full control of the operation and configuration of the various components of the instrument. It features fully automated instrument control including start up, plasma ignition sequence and shut down. The user friendly interface provides relevant controls for tuning, diagnostics, and instrument protection.



*Nu Plasma II software analysis window*



*Magnet scan window showing peak shapes of Neodymium isotopes in coincidence*

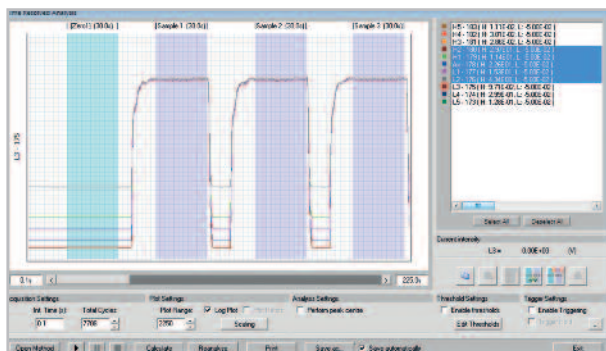
Full integration with accessories such as auto samplers and laser ablation systems is also supported. The standard Nu Instruments Calculation Editor (NICE) software provides user-definable data reduction functions. Alternative options are also available. Both raw and calculated data are available for each sample run along with full logging of instrument settings and operational parameters. Data can be analysed on or off-line and can be easily exported for further analysis to third party software packages. Lifetime software upgrade is also provided free of charge.



## Time Resolved Analysis

The Time Resolved Analysis (TRA) feature was specifically developed for the analysis of transient signals resulting from coupled laser ablation systems, GC systems, hydride generators etc.

Within the TRA, data can be acquired at customisable integration times and the generation of calculated results is made easy by the simple and flexible data selection capabilities of the utility.



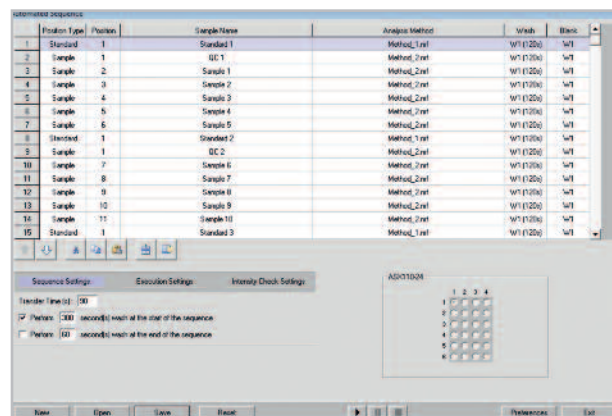
*Time Resolved Analysis window*

Data can be subsequently exported for further off-line analysis with popular third party data reduction software packages such as Glitter and lolite or reanalysed in the Nu Plasma II software. External hardware triggering is also available allowing data acquisition initiation or pausing within the single or multiple TRAs.

## Sequence Editor

The Nu Plasma II software incorporates a comprehensive and flexible integrated sequence editor enabling easy creation of automated sample analysis for unattended measurements in conjunction with an auto-sampler.

Creation of a new sequence is simple and rapid. Wash and blank measurement options can be fully customised for each sample and easily edited.



*Automated Sequence Editor window*

Sequences can be fully edited at any time, even whilst running, allowing the analyst to prioritise samples and providing maximum flexibility without disruption to the on-going measurement. Furthermore, the automatic shutdown of the instrument on completion option is ideal for overnight runs.

Nu Plasma II  
Multi-Collector ICP-MS



Nu Plasma 1700  
Multi-Collector ICP-MS



Nu TIMS  
Thermal Ionisation MS



Attom  
High Resolution ICP-MS



Astrum  
Glow Discharge MS



Evolution  
HR Gas Analysis MS



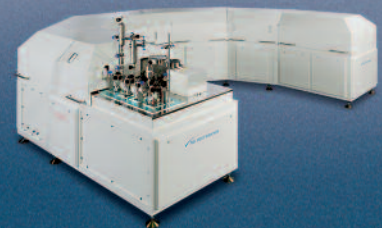
Noblesse  
Noble Gas MS



Aspect  
HR Stable Isotope Ratio MS



Panorama  
HR Stable Isotope Ratio MS



Horizon  
Stable Isotope Ratio MS



Perspective  
Stable Isotope Ratio MS



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