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# Neptune: A new High Precision Multicollector ICP Mass Spectrometer

**Johannes Schwieters** (jschwieters@compuserve.com), **Meike Hamester**, **Gerhard Jung**, **Reinhold Pesch**, **Lothar Rottmann**, **Dietmar Tuttas** & **Julian Wills**

Finnigan MAT GmbH, Barkhausenstrasse 2, Bremen, 28197, Germany

In this paper the performance of a new variable multicollector high precision ICP mass spectrometer will be presented: the NEPTUNE. The NEPTUNE combines the strength of the latest high precision isotope ratio measurement technology with the versatility of an advanced ICP ion source and high mass resolution. The innovative modular design consists of three modules: i.) the multicollector module has been taken form the TRITON which is a new variable multicollector single focussing magnetic sector thermal ionization mass spectrometer for ultra high precision isotope ratio measurements; ii.) the transfer optics module consists of high efficiency transfer lenses for high transmission, high stability and low mass discrimination; an electrostatic sector analyzer (ESA) is used to ensure double focussing ion optics and high mass resolution, iii.) the ICP inlet module is adapted from the ELEMENT2 which is a proven single collector double focussing magnetic sector ICP mass spectrometer with high mass resolution and ultra trace detection capabilities. The ICP inlet module is kept at ground potential to allow easy coupling of external sample introduction peripherals, e.g. laser ablation systems. The sensitivity is 1 GHz/ppm (mass resolution R=450) for In using standard nebulizers. Desolvating or ultrasonic nebulizers can be used to further improve sensitivity. The mass resolution can be up to R=3000 while still keeping flat top peaks, which are essential for high precision isotope ratio measurements. The new variable multicollector has eight motorized detector carriers with in situ positional control. The detectors can be either Faraday cups or miniaturized channeltron ion counters (Multi Ion Counting-MIC option). The "plug-in" detectors are easily exchangeable. The user can easily configure the variable multicollector array according to the specific needs of the application (e.g. laser ablation of very small samples) through a mixed array of Faraday cups and ion counters. Up to 17% relative mass range can be measured in parallel (e.g. Pb-U and $^{6}$Li-$^{7}$Li). Multicollection at high mass resolution requires precise positioning of the detectors. This is supported by the dynamic zoom optics. The dynamic zoom optics consists of two quadrupole lenses that finely adjust the ion beams to pass through the center of the small entrance slits of the high mass resolution multicollector detectors. For the analysis of real samples, polyatomic interferences can be a major problem that finally limits the reliability of the analytical measurement. This is true for elemental analysis and in particular for high precision isotope ratio measurements. High mass resolution is the only general solution to detect and to separate polyatomic interferences. We will discuss the new features of the instrument with some analytical examples.