Use of 10^{13} ohm Faraday cup amplifiers in (LA-) MC-ICP-MS: External precision of $^{234}U/^{238}U$ ratios and $\delta^{11}B$

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High-precision isotope ratio measurements are made possible by using mass spectrometers with arrays of Faraday cups, since this detector type is highly stable and linear over a wide dynamic range of ion beam intensities. However, for samples where the total analyte quantity is limited or where low-abundance isotopes are measured, measurement precisions for the resulting low intensity ion beams are limited by electronic baseline noise.

Thermo Scientific 10^{13} ohm Faraday cup current amplifiers improve the signal/noise ratio. External reproducibility of isotope ratio measurements from ion beams with intensities from 3 - 200 fA (0.3 – 20 mV on standard 10^{11} Ω amplifier, or ca. 20 kcps – 1.25 Mcps) intensity are significantly improved when compared against those measured with standard amplifiers [1]. New propriety technology means that the settling times of the 10^{13} ohm amplifiers are not greatly extended. Thus, with care for signal stability, application in laser ablation (LA-) MC-ICP-MS could be feasible, improving precision for high-spatial resolution isotopic measurements.

Data from a Thermo Scientific NEPTUNE *Plus* MC-ICP-MS with Jet Interface option for highest-sensitivity, demonstrates exceptional mass bias and detector stability. The reproducibility of $^{234}U/^{238}U$ ratios with 1 pg ^{234}U consumed per run was 0.6 ‰ (2σ) using a Faraday cup with 10^{13} Ω current amplifier for the ^{234}U beam.

At the other end of the mass spectrum, availability of B from marine carbonate samples can limit precision. We present new $\delta^{11}B$ data from both solution mode and laser ablation mode using 10^{13} ohm amplifiers. The external reproducibility of solution mode data are compared to data measured by standard amplifiers; LA data against multi-ion counter (MIC) data.

[1] Koornneef et al. (2014), *Anal. Chim. Acta* 819, 49–55.