

HIGH PRECISION 10ng LITHIUM SAMPLES

- **Stable mass fractionation when using the Enhanced Sensitivity interface**
- **Minimal mass fractionation drift for lowest mass elements over several hours**
- **Use of mixed 10^{11} and 10^{12} ohm resistors**

A 10 ppb solution of an Aldrich Li standard was introduced into the mass spectrometer under 'dry plasma' conditions, using a DSN-100 Desolvating Nebuliser System with a 100 $\mu\text{L}/\text{min}$ glass concentric nebuliser and the Enhanced Sensitivity interface (see Nu Instruments Application Note AN27).

Data was collected using static analysis, with ^7Li and ^6Li measured in Faraday cups connected to amplifiers fitted with a 10^{11} ohm resistor and a 10^{12} ohm resistor respectively. Each analysis consisted of one block of 55 integrations of 10 seconds on-peak measurements of Li, baselines were obtained by ESA deflection at the beginning of each analysis. The analysis duration was ca. 10 minutes. With an uptake rate of 100 $\mu\text{L}/\text{min}$, approximately 10 ng of sample was consumed during a single analysis. 21 repeat analyses were performed, equating to approximately 3.5 hours of data collection. The instrument was initially tuned for maximum sensitivity and no tuning of the instrument was made once the measurement sequence had started.

The Nu Plasma II zoom optics maintain good peak shapes (Fig 1) for both ^6Li and ^7Li , allowing precise measurement of the Li isotope ratios.

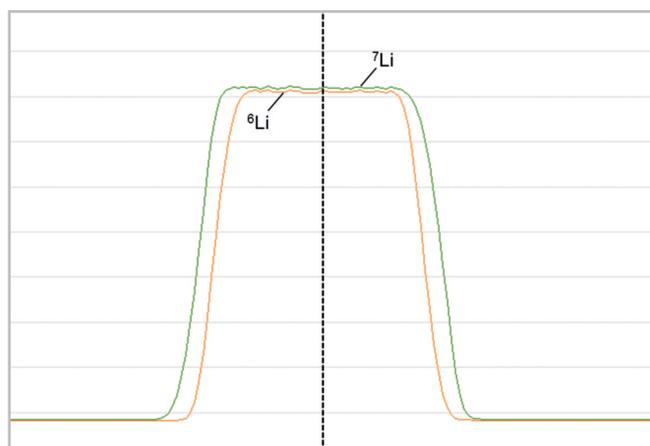


Fig. 1: Li isotopes ^6Li and ^7Li in coincidence. The center of the flat peaks were chosen as the mass analysis position.

Sample-calibrator bracketing has been used for the isotopic measurement. The results are shown in Table 1, where δ denotes the per mil deviation of the measured $^7\text{Li}/^6\text{Li}$ ratio relative to the average of the two ratios measured before and after.

Table 1: Sample-calibrator bracketing results of 21 repeat analyses of a 10 ppb Aldrich Li standard solution.

	$^7\text{Li}/^6\text{Li}$
Average δ (‰)	0.009
ISD (‰)	0.052

The total Li signal achieved was approximately 5.3 V, Li background was below 4 mV, with a relative contribution of less than 0.8‰. No mass fractionation correction has been applied to the measured Li isotope ratios.

Fig 2 shows the short-term reproducibility of the measured isotope ratios of the Aldrich Li standard solution. For each analysis of 55 integration cycles, the internal precisions for $^7\text{Li}/^6\text{Li}$ were between 0.04‰ and 0.06‰ (1RSE), highlighting the low noise of the pre-amplifiers, stability of baselines and excellent peak flatness. The external precision (10 brackets) for the uncorrected ratios was 0.052‰ (ISD), exhibiting the stability of the plasma conditions and mass fractionations. The observed mass fractionation was ca. 19‰ per amu.

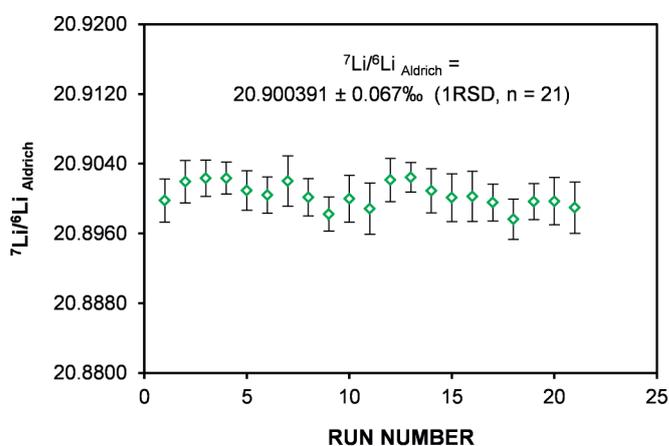


Fig. 2: Measured $^7\text{Li}/^6\text{Li}$ ratios of the 10 ppb Aldrich standard solution obtained over the course of 3.5 hours. Error bars are 2SE.