Nu TIMS

TIMS Mass Range and Alignment Capability with Nu Instruments Zoom Optics

- Lithium to Uranium demonstrated
- Perfect Peak Alignment with Zoom Optics
- Zoom Parameter files recalled and set instantly
- Automatic mixed element turret run capabilities

The Nu TIMS thermal ionisation mass spectrometer is the first TIMS instrument to use fixed detectors with only Zoom Lens technology for alignment of the peaks. This powerful detector arrangement allows isotopic analysis of all elements from Lithium to Uranium and beyond to the full range of the magnet, 300 amu.

Setting the zoom parameters for alignment of each element is a simple process similar to tuning an ion beam. Once saved the zoom parameter files can be instantly recalled for analysis of the chosen element.

With 12 Faraday cups and two ion counting positions available for multi-collector analysis this detector arrangement also provides the flexibility to measure interferences during the measurement. The table below shows a selection of common elements that can be analysed by TIMS using this detector configuration. Also available is a 16 Faraday instrument with 5 ion counting positions.

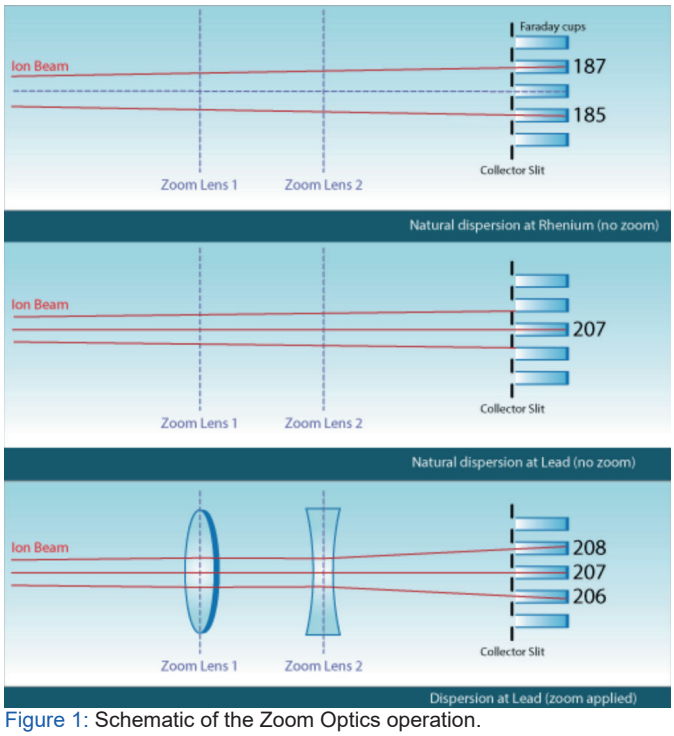

Figure 1: Schematic of the Zoom Optics operation.

Element (interferences) POSITIVE	H8	X	H7	H6	H5	H4	H3	H2	H1	Ax	L1	IC0 (Daily)	L2	IC1	X	X	L3
Lithium, Li	^{7}Li																^{6}Li
Calcium, Ca (K)	^{44}Ca				^{43}Ca				^{42}Ca								^{40}Ca
Chromium, Cr	^{54}Cr			^{53}Cr			^{52}Cr			^{5}V			^{50}Cr				
Iron, Fe	^{58}Fe			^{57}Fe			^{56}Fe						^{54}Fe				
Strontium, Sr (Rb, Kr)					^{88}Sr		^{87}Sr		^{86}Sr		^{85}Rb		^{84}Sr				
Molybdenum, Mo	^{100}Mo				^{98}Mo		^{97}Mo		^{96}Mo		^{95}Mo		^{94}Mo				^{92}Mo
Cerium, Ce							^{142}Ce		^{140}Ce		^{138}Ce		^{138}Ce				
Neodymium, Nd (Sm, Ce, Pr)			^{150}Nd		^{148}Nd	^{147}Sm	^{146}Nd	^{145}Nd	^{144}Nd	^{143}Nd	^{142}Nd		^{140}Ce				
Lead, Pb							^{208}Pb	^{207}Pb	^{206}Pb		^{204}Pb						
Uranium, U										^{238}U		^{236}U	^{235}U	^{234}U			
Plutonium, Pu						^{244}Pu		^{242}Pu	^{241}Pu	^{240}Pu	^{239}Pu						
Element (Interferences) NEGATIVE																	
Boron, BO_2									$^{11}BO_2$				$^{10}BO_2$				
Irridum, IrO_2									$^{193}IrO_2$		$^{191}IrO_2$						
Tungsten, WO_3 (ReO_3, OsO_3, TaO_3)			$^{188}OsO_3$		$^{186}WO_3$	$^{185}ReO_3$	$^{184}WO_3$	$^{183}WO_3$	$^{182}WO_3$	$^{185}TaO_3$	$^{180}WO_3$						
Osmium, OsO_3 (ReO_3)			$^{192}OsO_3$		$^{190}OsO_3$	$^{189}OsO_3$	$^{188}OsO_3$	$^{187}OsO_3$	$^{186}OsO_3$	$^{185}ReO_3$	$^{184}OsO_3$						
Rhenium, ReO_4									$^{187}ReO_4$		$^{185}ReO_4$						

Figure 2: Detector configuration of the factory demonstration instrument showing the collectors used for the peak alignments overleaf.

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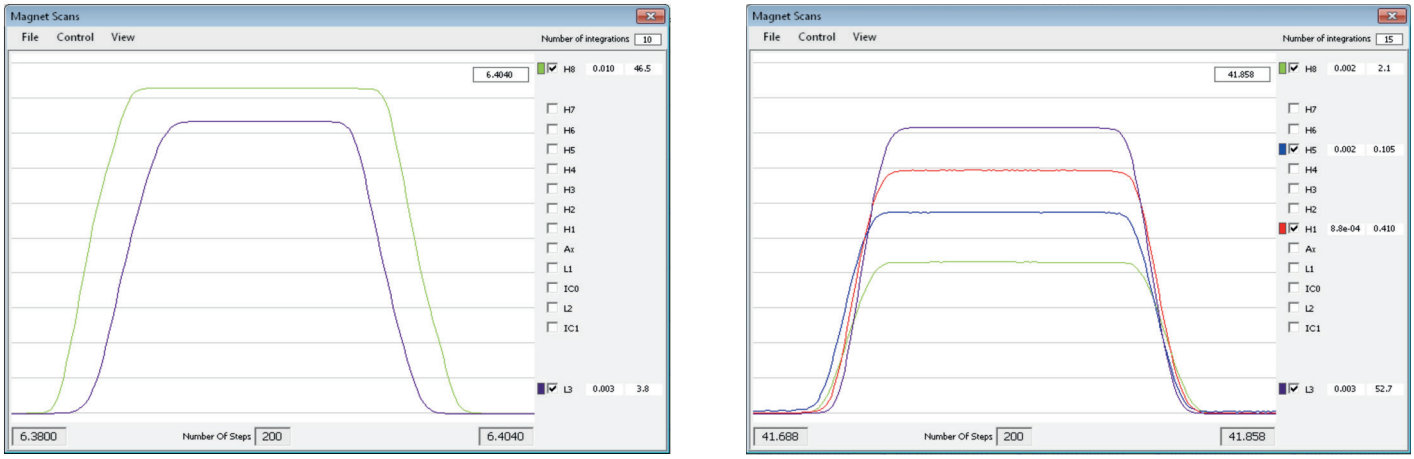

Figure 3: Peak alignment of Lithium and Calcium isotopes. In the case of Lithium, it can clearly be seen that the ^{7}Li peak is significantly wider than the ^{6}Li peak as is expected for increasing masses.

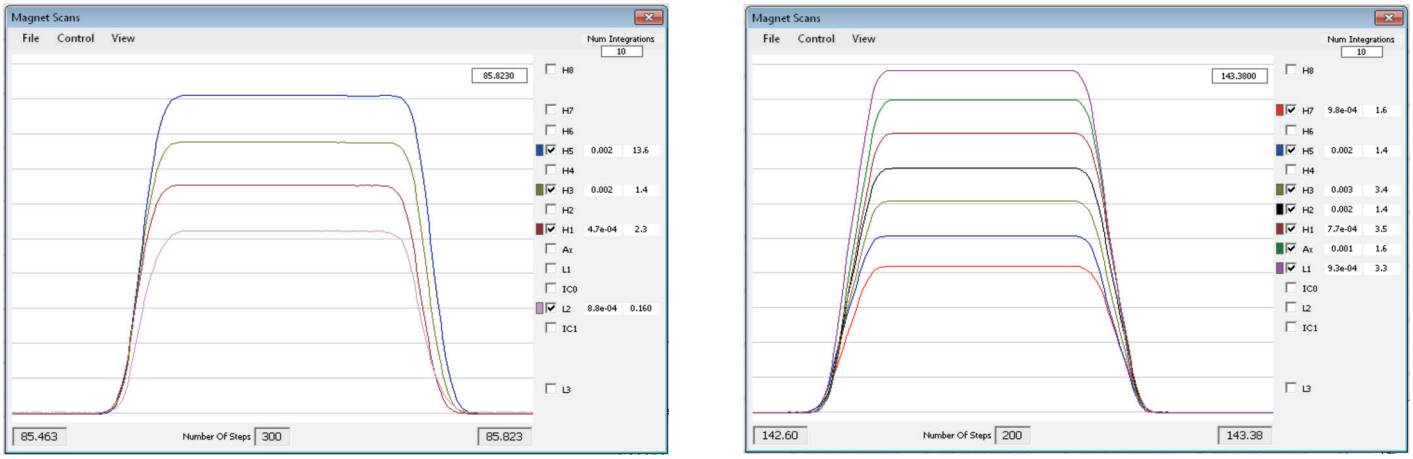

Figure 4: Peak alignment of Strontium and Neodymium isotopes.

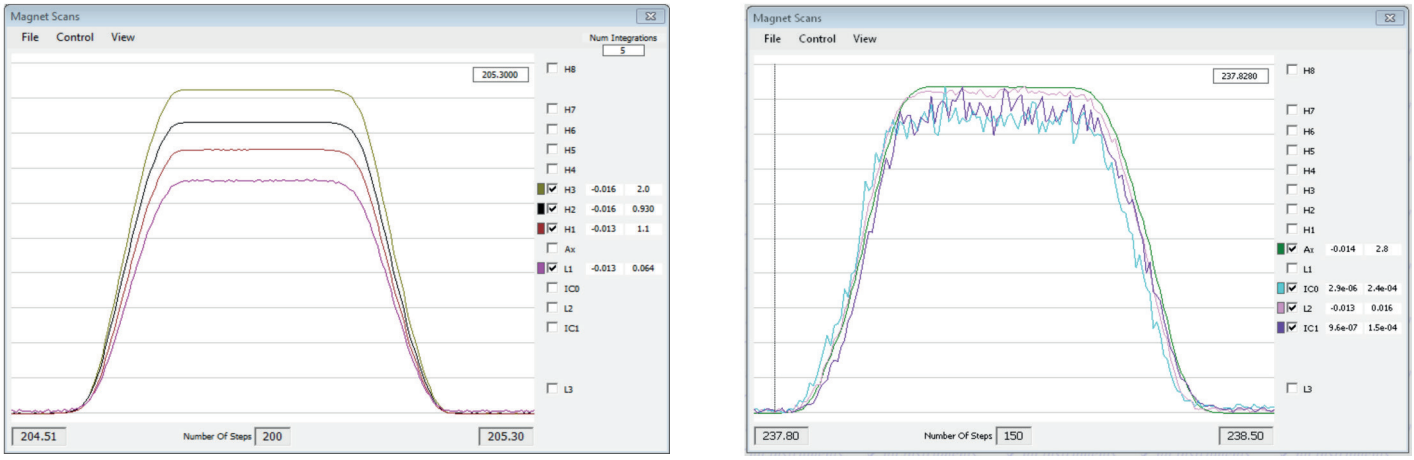

Figure 4: Peak alignment of Lead and Uranium isotopes. The Uranium minor isotopes of ^{234}U and ^{236}U are on the Daly and multiplier ion counters respectively.

Conclusion

The Nu TIMS with Zoom Optics for perfect peak alignment is demonstrated to be able to analyse the full range of elements, from Lithium through to Uranium with instant switching between different isotope systems. This allows mixed samples to be easily run on a turret automatically.