

Initial Investigation of the New Apex Sample Inlet System for Finnigan Neptune MC-ICPMS

Dan Wiederin
Elemental Scientific
www.icpms.com

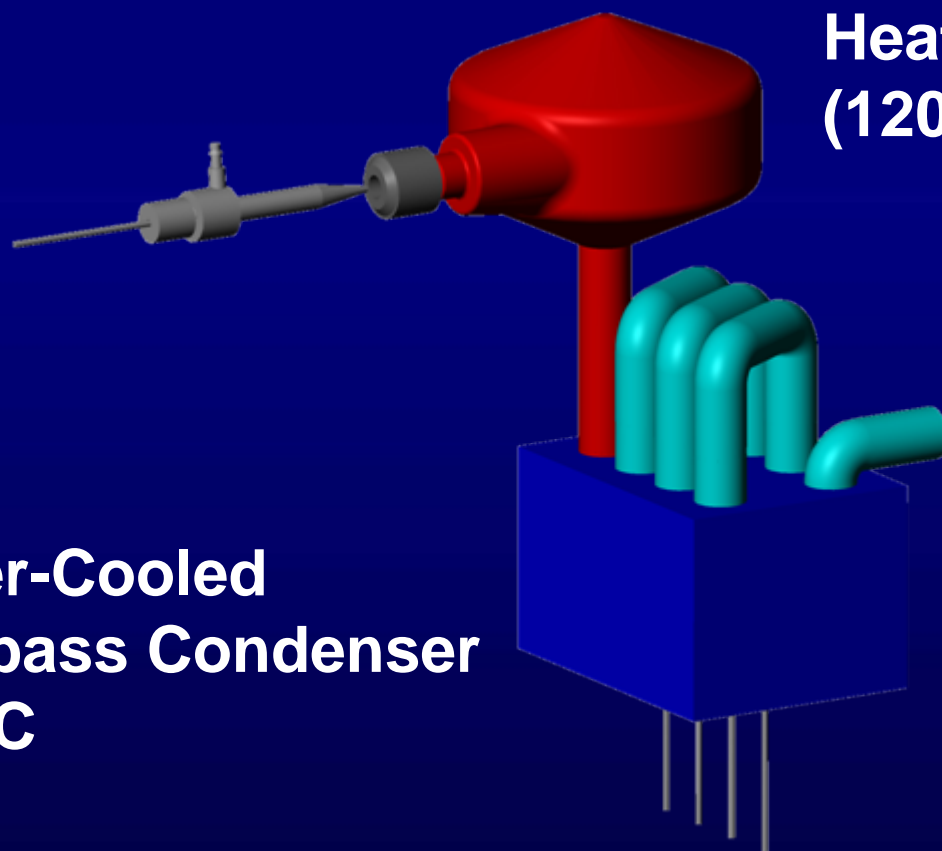


Apex Sample Introduction System for ICPMS

- High sample transport efficiency
- High Sensitivity at Low Flow Rates (100 to 300 $\mu\text{L}/\text{min}$)
- Low Background
 - Self-aspirating PFA nebulizer
 - Inert, o-ring-free flow path
- Fast Rinse-out
- Quartz or HF resistant



Apex Block Diagram



**Heated Cyclonic SC
(120C/140C)**

**Peltier-Cooled
Multipass Condenser
2C/-5C**

Total Internal Volume 180 ml



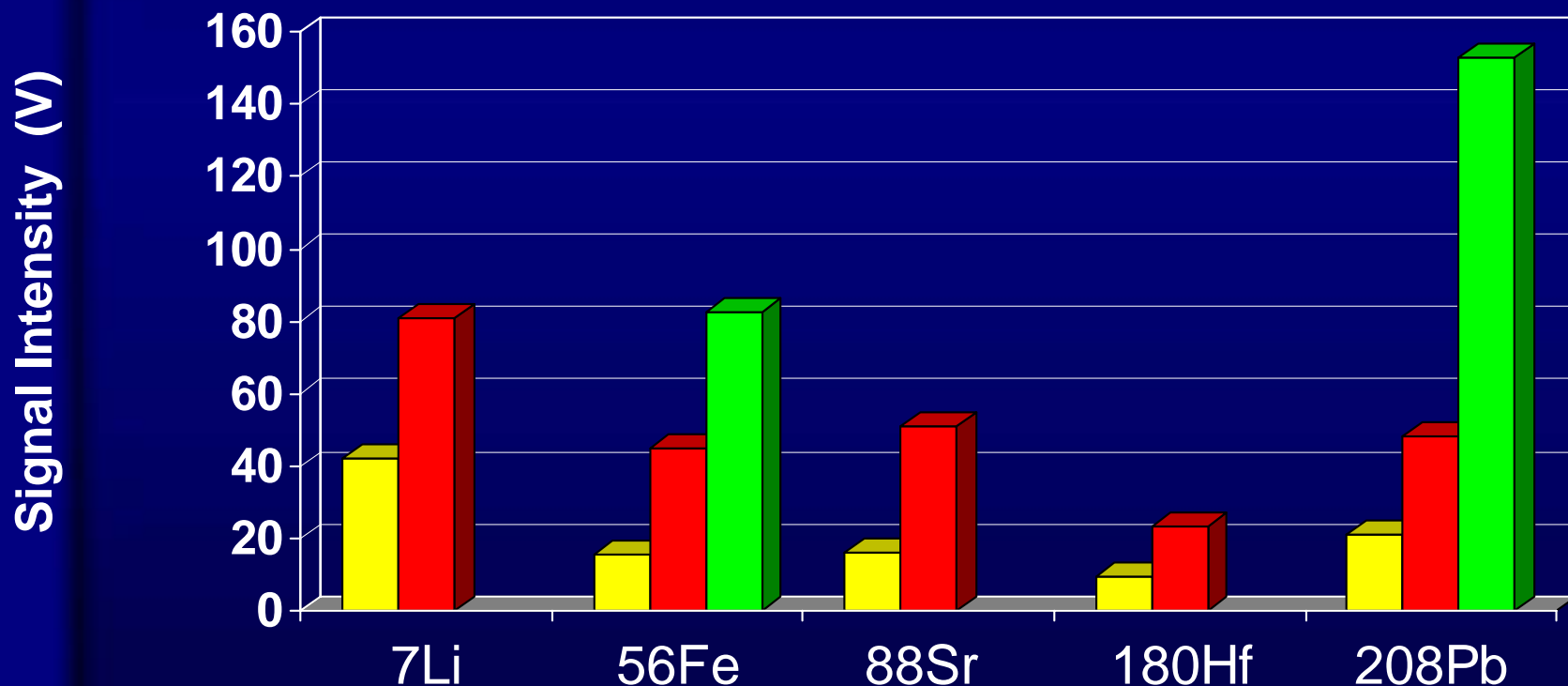
Apex Q with Finnigan Neptune

- Small Size, Easy Installation.
- High sample transport efficiency.
- Utilizes PFA nebulizers from 20 to 300 $\mu\text{l}/\text{min}$.
- Low background, fast rinse-out.



Relative Signal Intensity Comparison Apex vs. Aridus

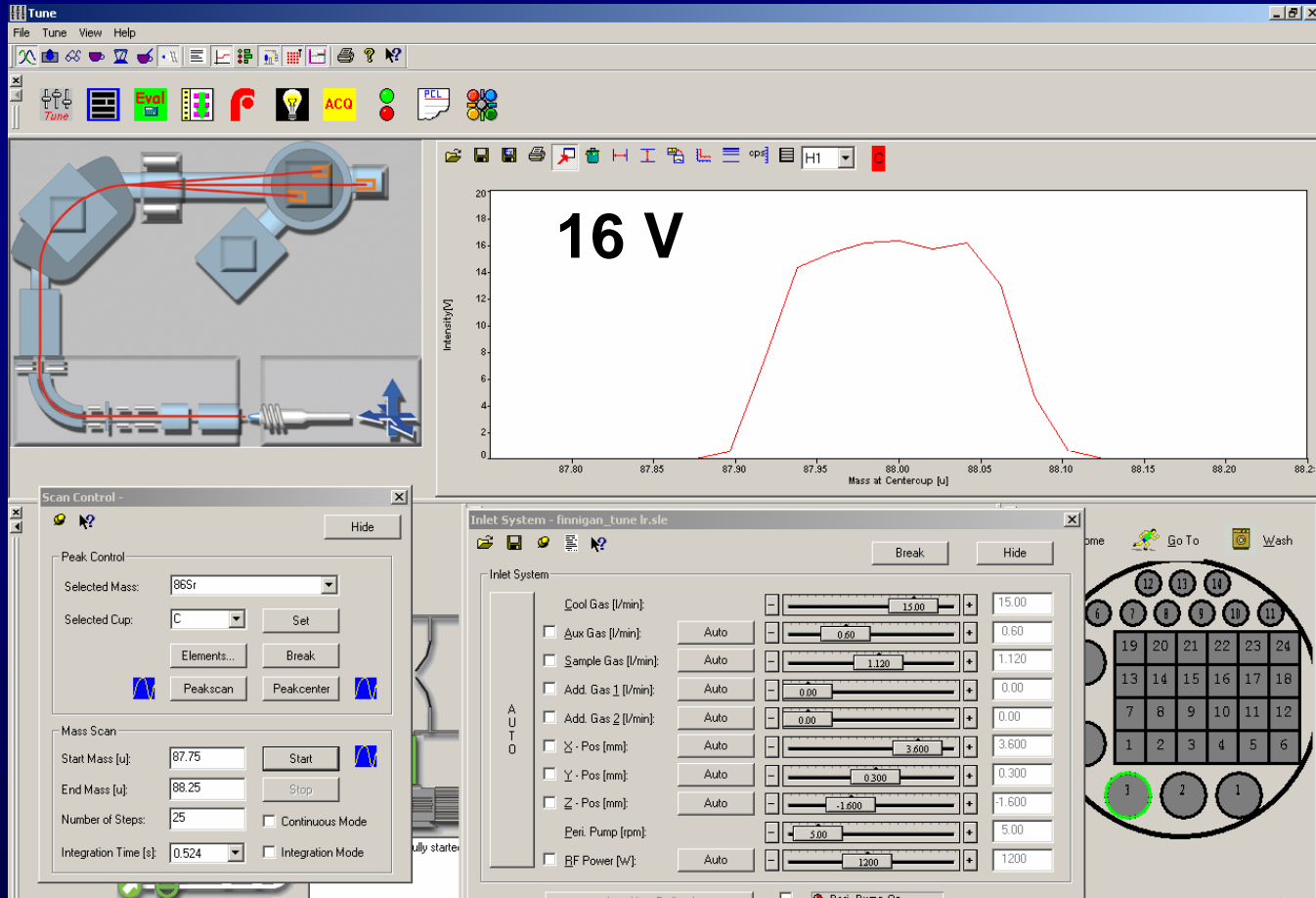
■ Aridus T1H ■ Apex 95 $\mu\text{L}/\text{min}$ ■ Apex 300 $\mu\text{L}/\text{min}$



ThermoFinnigan *Neptune* MC-ICPMS, HP Cone
Li 1 ppm, Fe 3 ppm (HR); Sr, Hf, Pb: 200 ppb



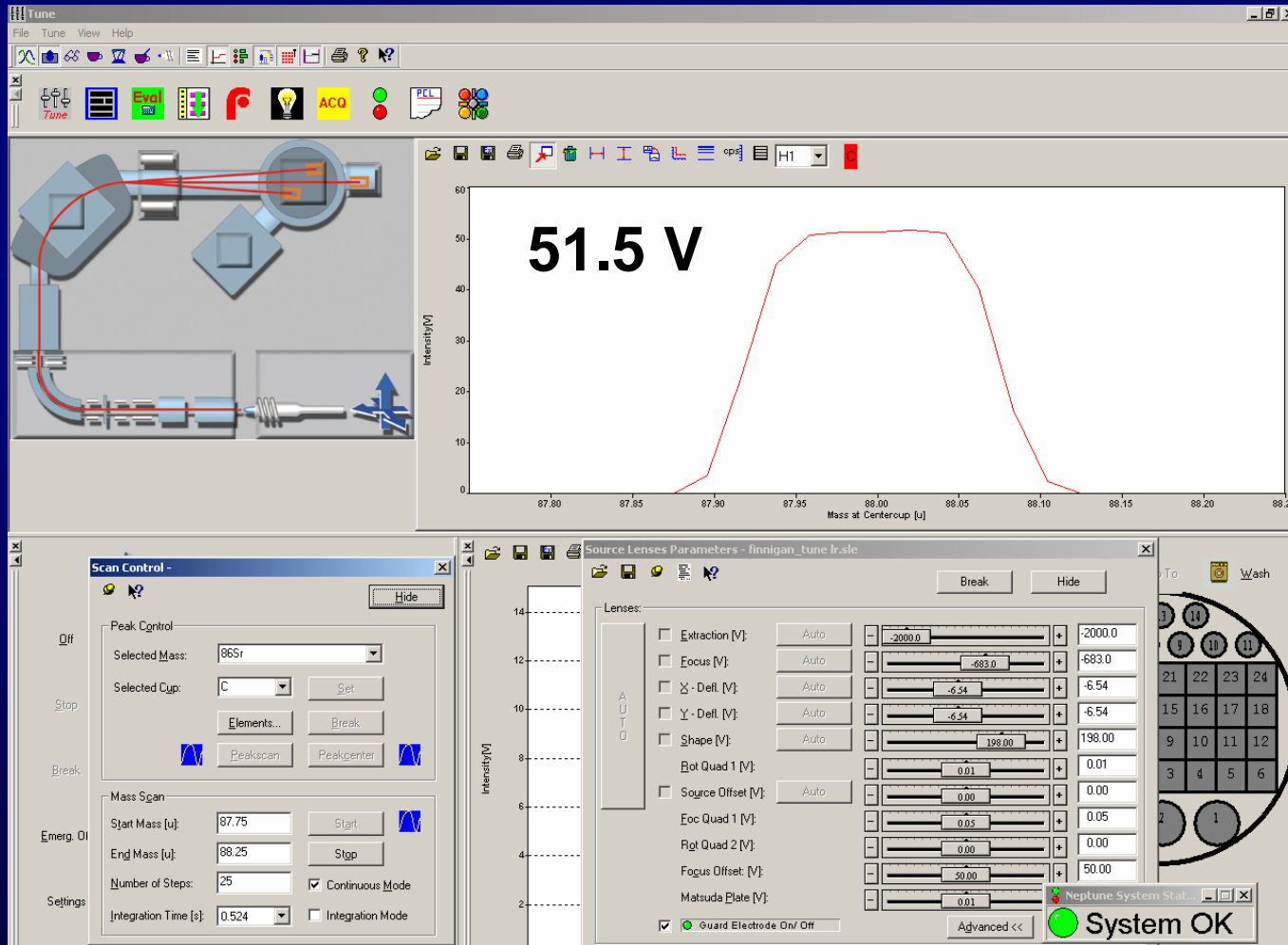
Neptune/Aridus 200 ppb Sr-88 Spectrum



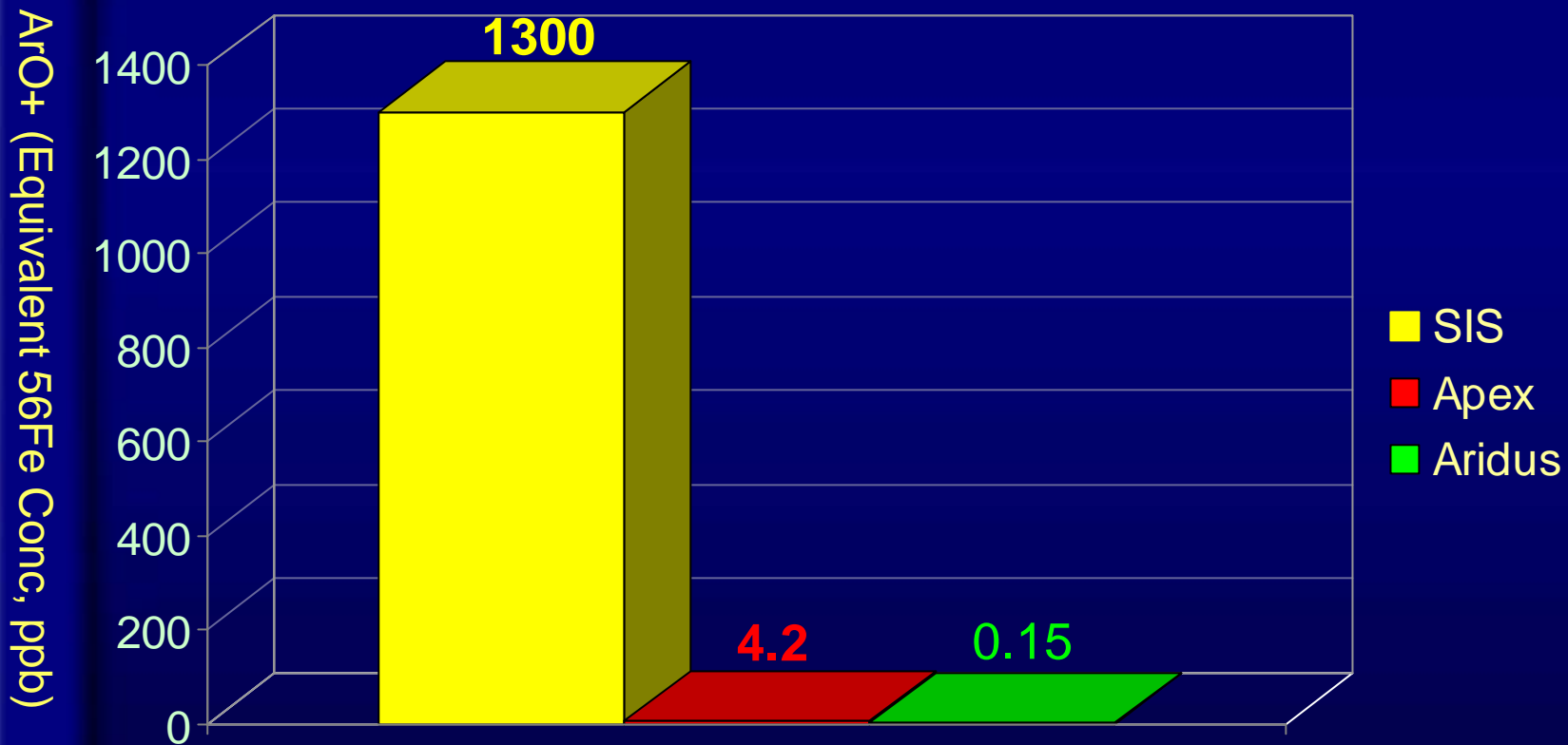
Aridus Sweep = 6.28, N2=0 Spray chamber 70 C, Desolvator 160 C



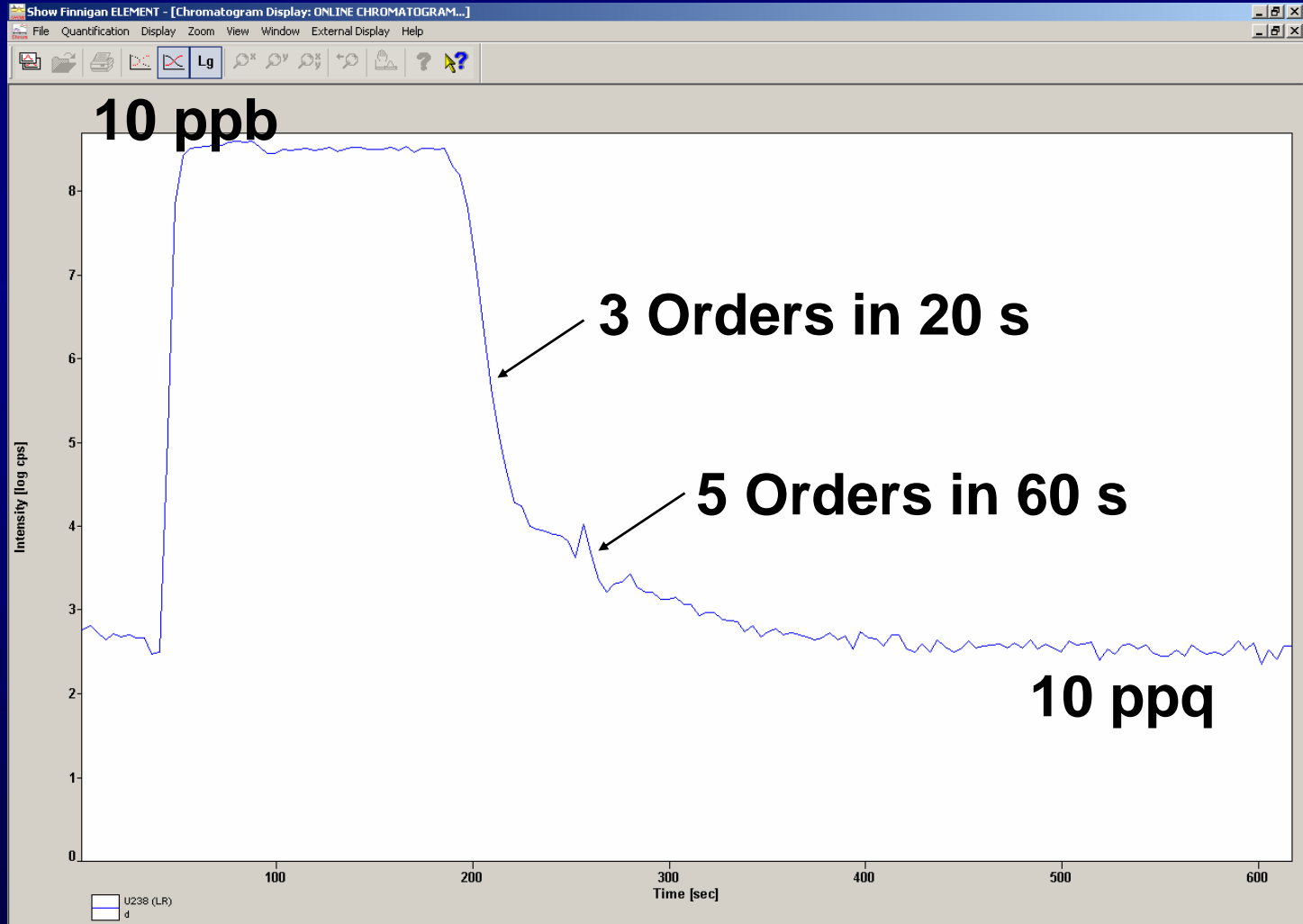
Neptune/Apex-IR PFA-100 200 ppb Sr-88 Spectrum



Rate of Argon Oxide Formation SIS vs. Apex vs. Aridus Neptune MC-ICPMS



Apex Q Rinse-out U-238 Six Orders of Magnitude



PFA ST Nebulizer/Finnigan *ELEMENT2*



Sr 100 ppb (NBS 987)

Neptune/Apex-IR PFA-100

BlockControl: Block: 2 Cycle Control: Cycle: 1

St Dy MD TE RB RN B D

Cycle	Time	86Sr	84Sr/86Sr (1)	87Sr/86Sr (2)	88Sr/86Sr (3)
***	Mean	2.8821655e+000	5.6421189e-002	7.1025184e-001	8.7253730e+000
***	StdErr (%)	2.2270399e-001	4.9552067e-003	3.8374450e-004	5.7109502e-004
***	StdErr (abs)	6.4186975e-003	2.7957865e-006	2.7255523e-006	4.9830171e-005
***	StdDev (%)	1.4085037e+000	3.0945256e-002	2.3964836e-003	3.5204661e-003
***	StdDev (abs)	4.0595407e-002	1.7459681e-005	1.7021069e-005	3.0717380e-004
***	Valid Values	40(40)	39(40)	39(40)	38(40)

press F1



Sr 10 ppb (NBS 987) Neptune/Apex-IR PFA-100

BlockControl		Cycle Control		St	Dy	MD	TE
				Block:	1	Cycle:	39 <div style="float: right; text-align: right;"> </div>
		FB	RN	B	D		
Cycle	Time	86Sr	84Sr/86Sr (1)	87Sr/86Sr (2)	88Sr/86Sr (3)		
***	Mean	2.5588882e-001	5.5798150e-002	7.1033644e-001	8.7265516e+000		
***	StdErr (%)	1.3528074e-001	4.6181854e-002	1.0990816e-003	1.2755123e-003		
***	StdErr (abs)	3.4616829e-004	2.5768620e-005	7.8071774e-006	1.1130824e-004		
***	StdDev (%)	8.5559053e-001	2.8840558e-001	6.7751942e-003	7.8627856e-003		
***	StdDev (abs)	2.1893605e-003	1.6092498e-004	4.8126674e-005	6.8615004e-004		
***	Valid Values	40(40)	39(40)	38(40)	38(40)		



Sr Ratios (NBS 987) Apex-Neptune-PFA Nebulizer

	Standard Error (abs) x10 ⁻⁶		
	SIS/PFA-50	Apex /PFA-100	
	200 ppb Sr	10 ppb Sr	100 ppb Sr
⁸⁴ Sr/ ⁸⁶ Sr*	15.3	25.8	2.8
⁸⁷ Sr/ ⁸⁶ Sr*	3.9	7.8	2.7
⁸⁸ Sr/ ⁸⁶ Sr	123	111	49.8

*Ratio normalized to ⁸⁸Sr/⁸⁶Sr



Summary: Apex with Finnigan Neptune

- Highly efficient and sensitive inlet system for MC-ICPMS.
- Alternative to membrane desolvation systems.
- Low memory effects and fast rinse-out.
- Oxides reduced >200x vs. standard inlet but higher than membrane desolvation.
- Couples with nebulizers having a wide range of liquid flow rates (20-300 $\mu\text{L}/\text{min}$).



Acknowledgment

Edward Young
UCLA

