

# Measurement of Uranium Isotope Ratios in Undigested Urine

Apex Q

# Sample Prep Method

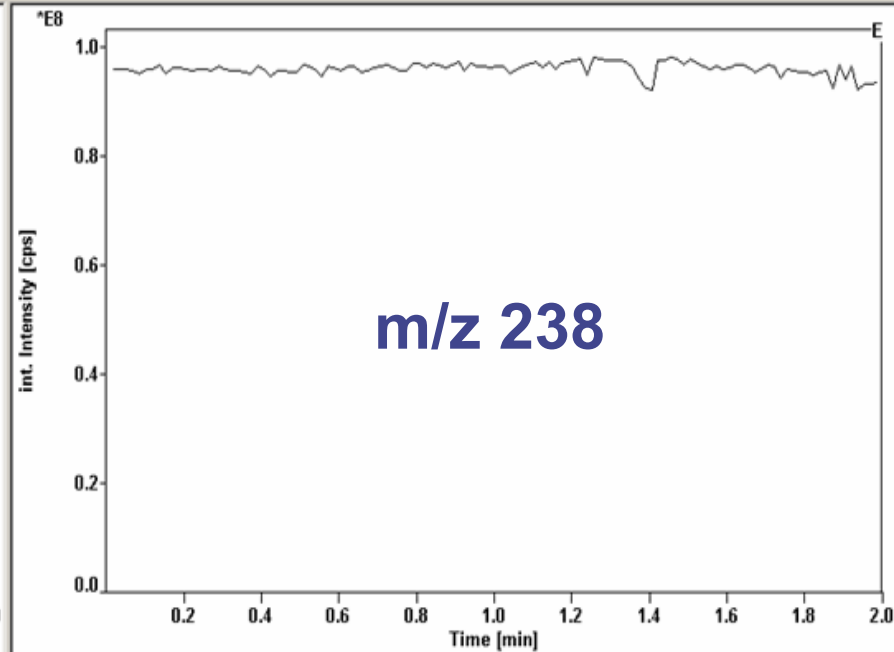
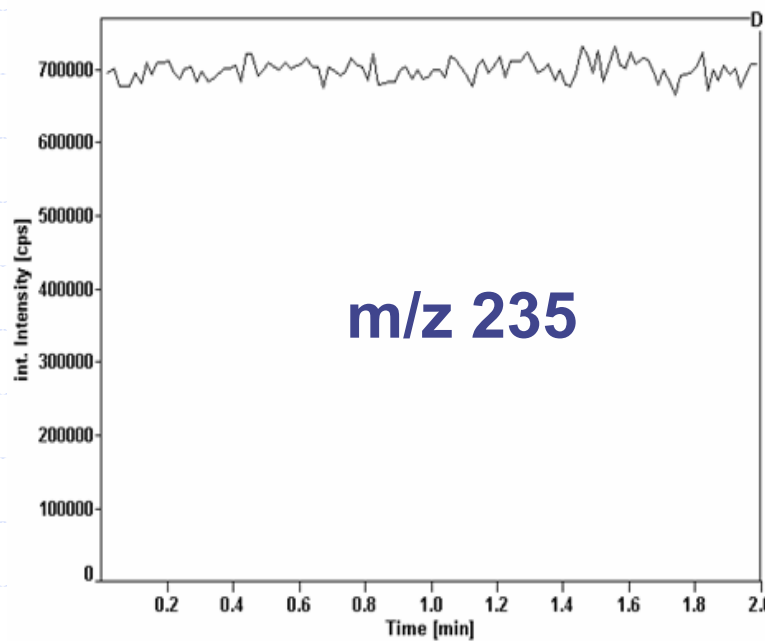
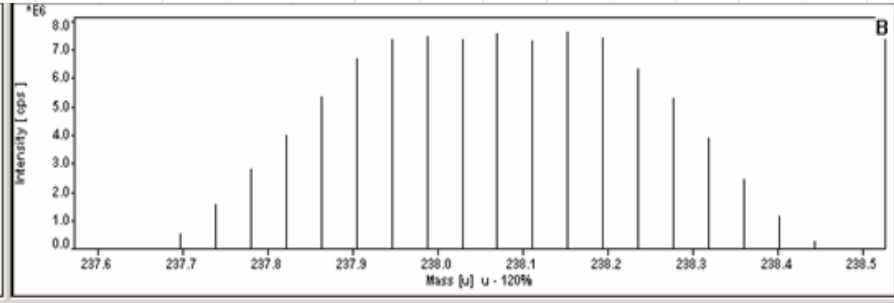
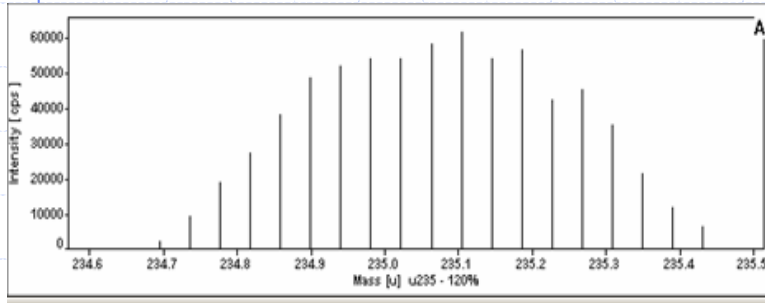
## U Ratio in Urine\*



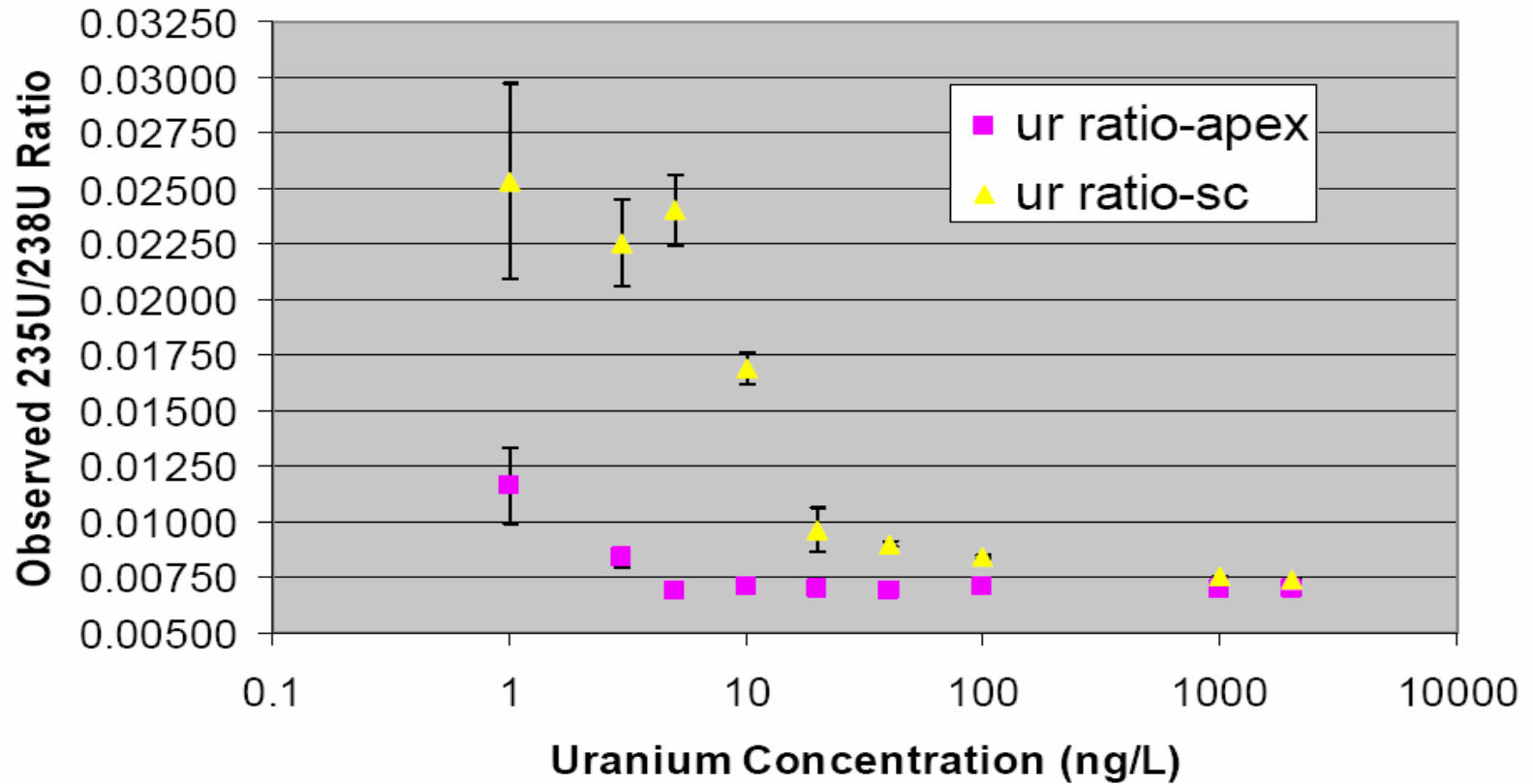
- ◆ 100  $\mu\text{L}$  urine diluted 1:10
- ◆ Final solution 15%  $\text{H}_2\text{O}_2$ , 1%  $\text{HNO}_3$
- ◆ 0.1% surfactant (self-aspirating nebulizer)
  
- ◆ Uranium concentration as analyzed typically 1-5 ppt
- ◆ Directly nebulized using Apex-PFA-100 nebulizer
  
- ◆ Deviation from CDC method:
  - Apex connected directly to ICP torch.
  - Mass Shift applied

**\*Based on method of Bill Ting US CDC, Atlanta, Georgia**

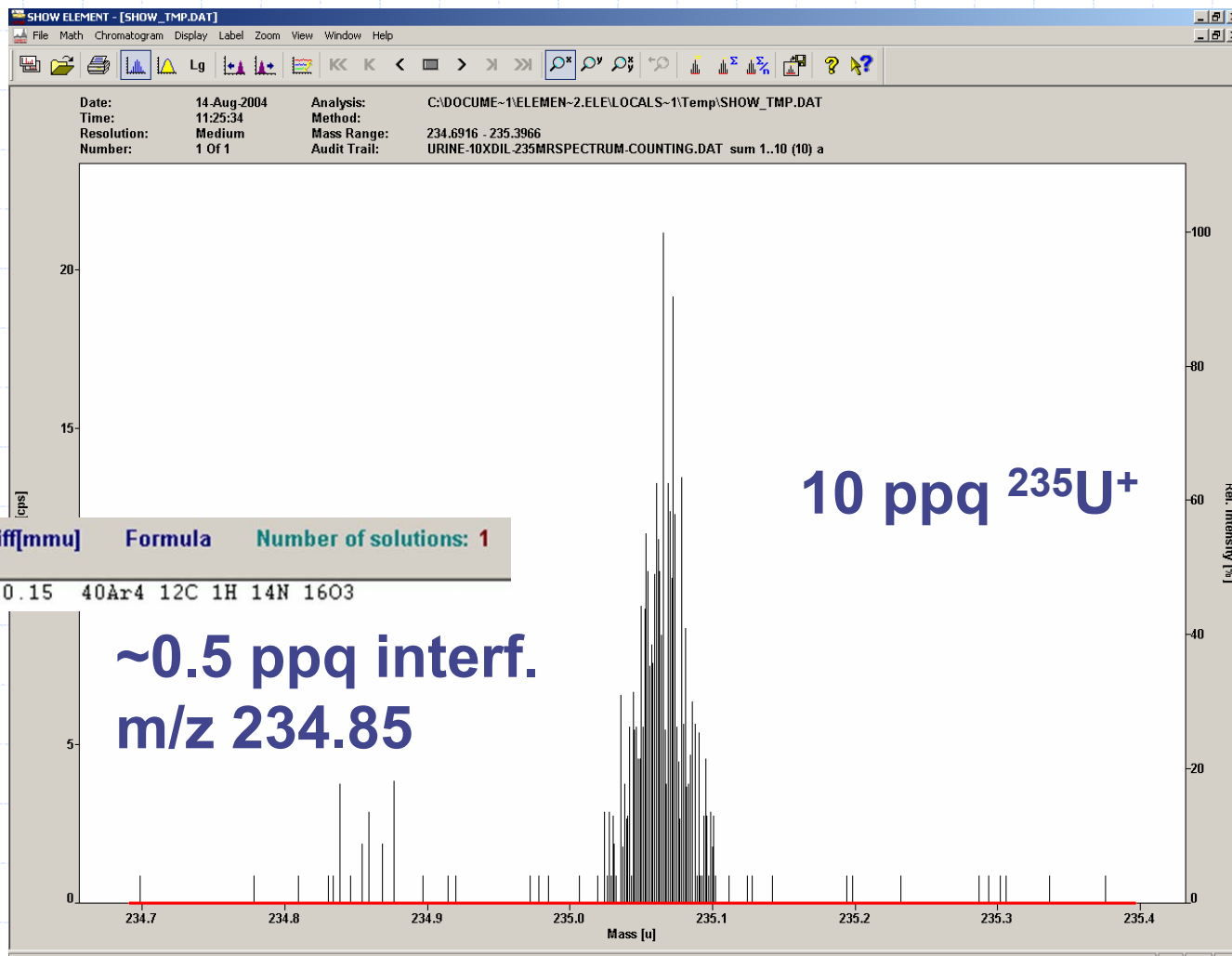
# Apex Q 1 ppb Uranium spike in Urine



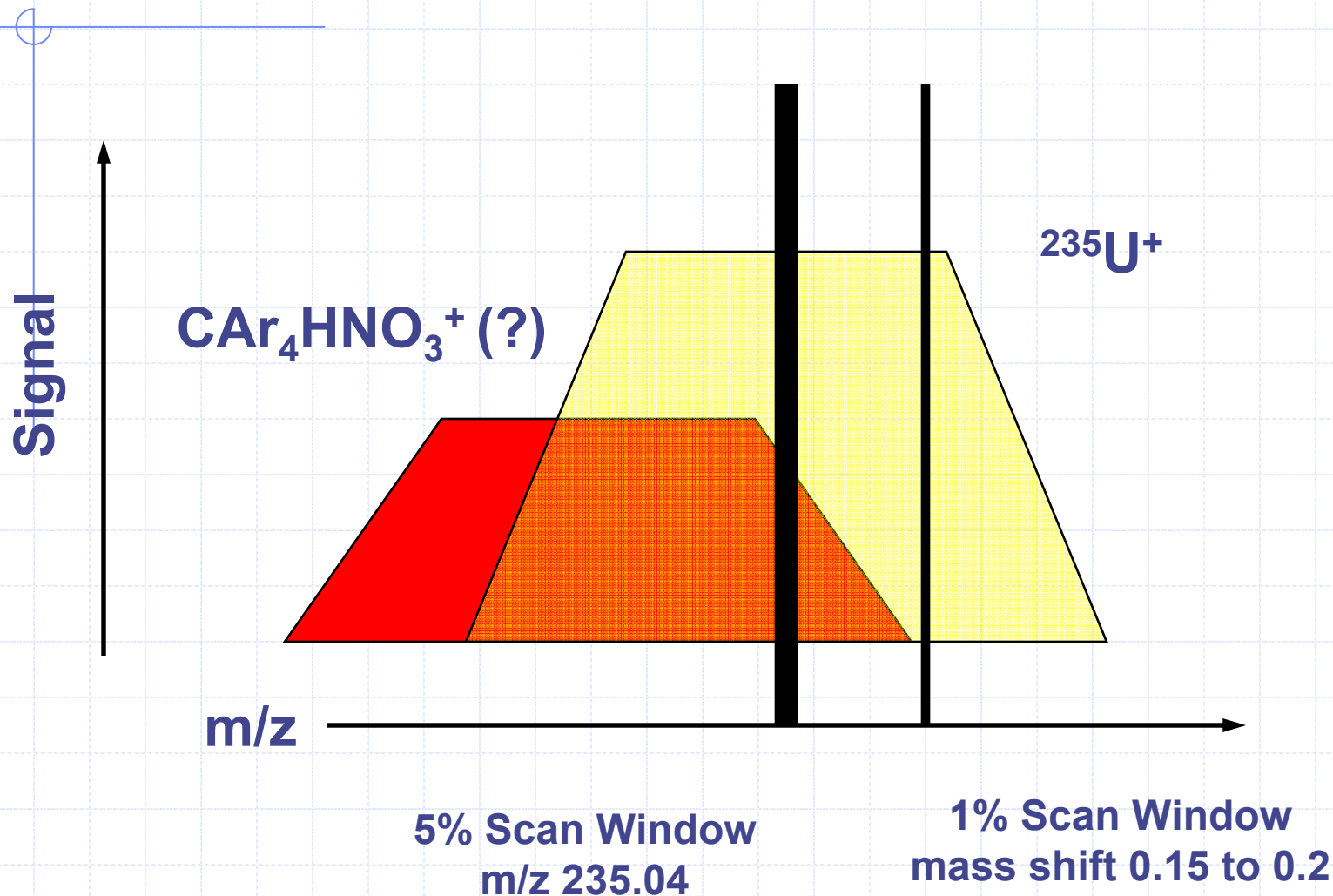
# $^{235}\text{U}/^{238}\text{U}$ Measurement in Urine using Apex Q vs. Quartz Spray Chamber\*



# MR $^{235}\text{U}$ Spectrum in Urine



# LR Mass Offset Eliminates Interference



# Method for U235/U238 in Urine

Method Data		Interference Correction		Quality Control										
Entry	Locked	Isotope	Accurate Mass	Method Mass Offset	Mass Window	Mass Range	Sample Time	Samples Per Peak	Integration Window	Scan Type	Detection Mode	Acqu Points	Internal Standard	Peak Shift
1	No	U235	235.0434	0.1500	1	235.039 - 235.047	0.5000	500	80	EScan	Counting	10		1.0
2	No	U238	238.0502	0.1500	1	238.046 - 238.054	0.0500	500	80	EScan	Counting	10		1.0
3		U235/U238												

**Estimated Time** X

<p>Time per Pass [min:sec:ms]</p> <p>Low Res.: 00 : 03 : 251</p> <hr/> <p>Med. Res.: 00 : 25 : 300</p> <hr/> <p>High Res.: 00 : 00 : 000</p>	<p>Time per Res. [h:min:sec]</p> <p>Low Res.: 00 : 02 : 43</p> <hr/> <p>Med. Res.: 00 : 00 : 25</p> <hr/> <p>High Res.: 00 : 00 : 00</p>
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**Total [h:min:sec]: 00 : 03 : 10**

# $^{235}\text{U}/^{238}\text{U}$ Ratio



$^{235}\text{U}:\text{}^{238}\text{U}$

0.008061

On-center

0.007409

Mass Shift 0.1

$0.007295 \pm 0.000064$

Mass Shift 0.15

**0.007253 reference  $^{235}/^{238}$**