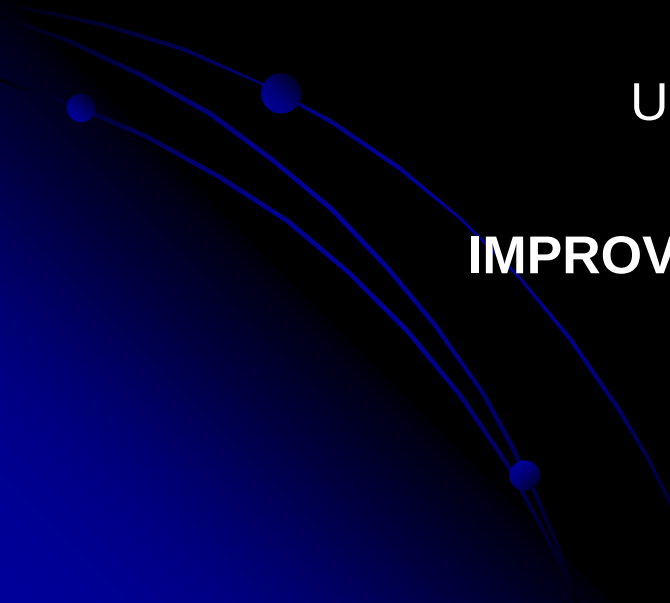


Independent Laboratory QA Support for the **IMPROVE Program**



Jewell Smiley
US EPA ORIA-Montgomery
Before the
IMPROVE Steering Committee Meeting
September 26-28, 2006

US EPA / NAREL

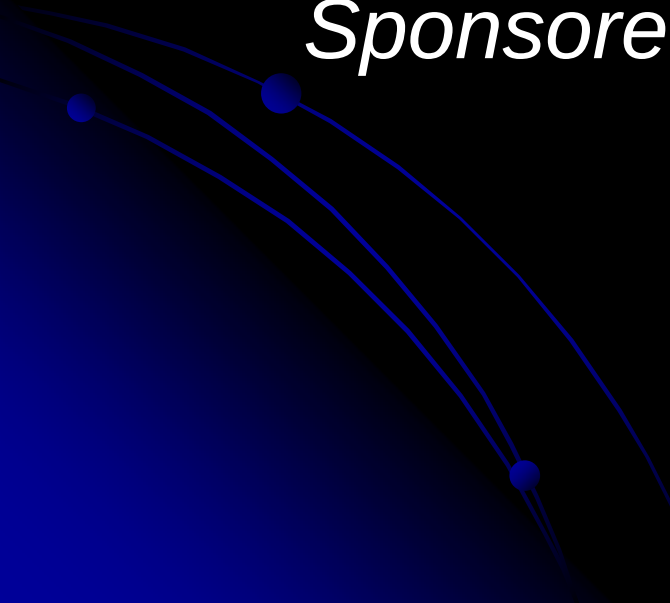


Specific QA Activities

- PT Samples
single-blind samples analyzed at different labs
- Laboratory TSA
on-site inspection and interviews with lab staff
- Special Studies
experimental investigations

Experimental Comparison of Several PM_{2.5} Speciation Laboratories

Sponsored by the US EPA in 2006



PT Samples Provided to Each Participating Lab

- Gravimetric Mass Analysis – ten filter samples and two metallic weights
- Ion Chromatography Analysis – six filter samples
- Carbon by Thermal Optical Analysis – six filter samples
- Elemental analysis by X-Ray Fluorescence – six filter samples

PT Samples Provided to Each Participating Lab

- Gravimetric Mass Analysis – ten filter samples and two metallic weights
- Ion Chromatography Analysis – six filter samples
- Carbon by Thermal Optical Analysis – six filter samples
- Elemental analysis by X-Ray Fluorescence – six filter samples

Speciation Air Samplers NAREL



Speciation Laboratories

California Air Resources Board (CARB) Sacramento, CA	Mass, Ions, Carbon, XRF
Desert Research Institute (DRI) Reno, NV	Mass, Ions, Carbon, XRF
Oregon Dept. of Environmental Quality (ODEQ) Portland, OR	Mass, Ions, XRF
Research Triangle Institute (RTI) Research Triangle Park, NC	Mass, Ions, Carbon, XRF
Crocker Nuclear Lab, University of California Davis, CA (UCD)	Mass, XRF
EPA's National Exposure Research Laboratory (NERL), Research Triangle Park, NC	XRF
EPA's National Air and Radiation Environmental Laboratory (NAREL), Montgomery, AL	Mass, Ions, Carbon

Gravimetric Mass Study Design

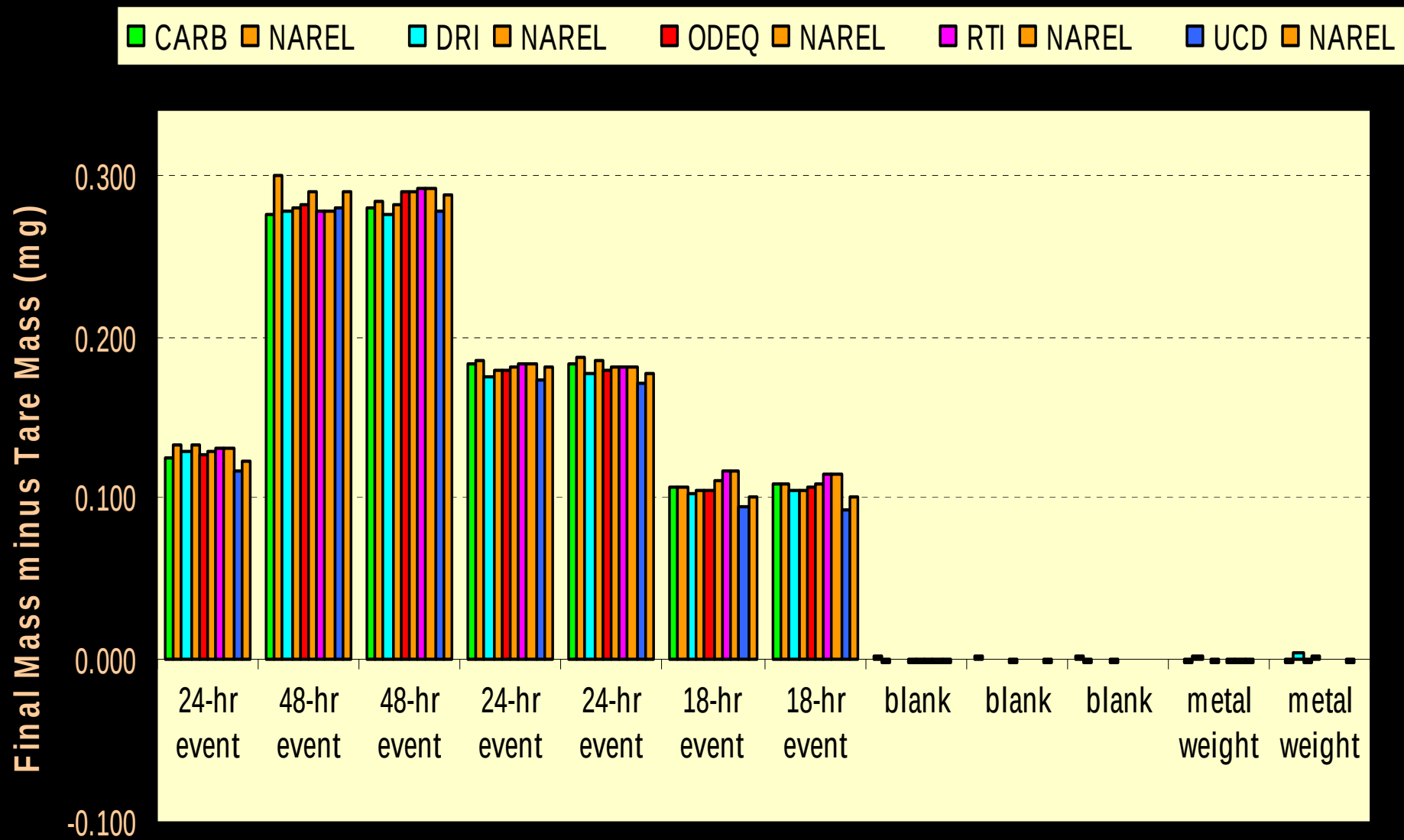
- 1) NAREL distributes clean filters and metallic weights to each participating lab for pre-weight.
- 2) All samples are returned to NAREL for pre-weight.
- 3) NAREL loads filters with PM_{2.5}
- 4) NAREL equilibrates all samples and measures post-weight.
- 5) Samples are shipped cool by express mail to each participating lab for post-weight.

post – pre = capture

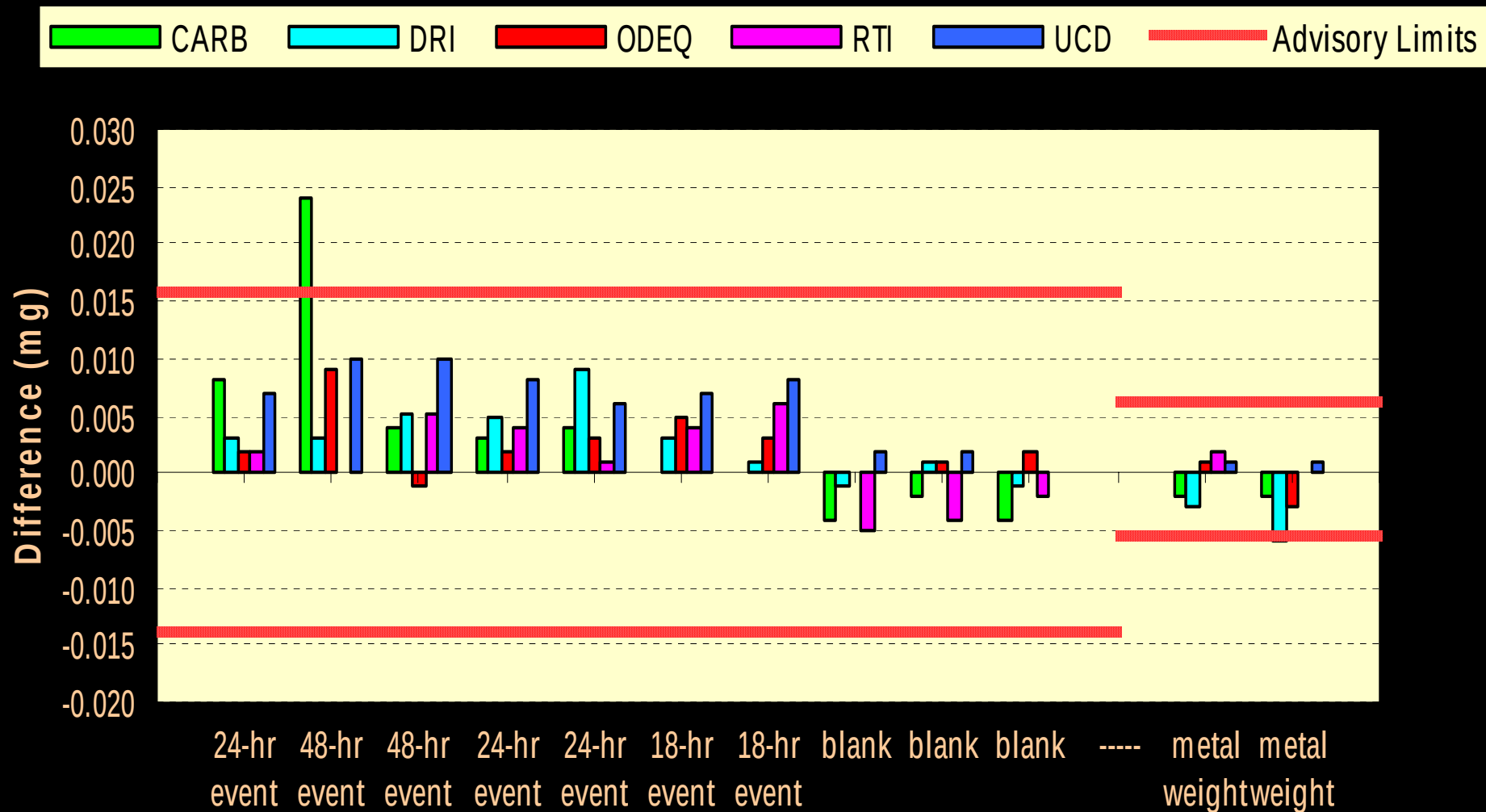
Weighing Chamber at NAREL



Captured PM2.5 Determined by Each Participating Lab and NAREL



PM2.5 Capture Comparisons - NAREL Value minus Participating Lab Value (negative value indicates a smaller capture determined by NAREL)



Speciation Air Samplers NAREL



Custom Filter Holder

Prototype Testing



0.241 mg

0.239 mg

0.242 mg

0.245 mg



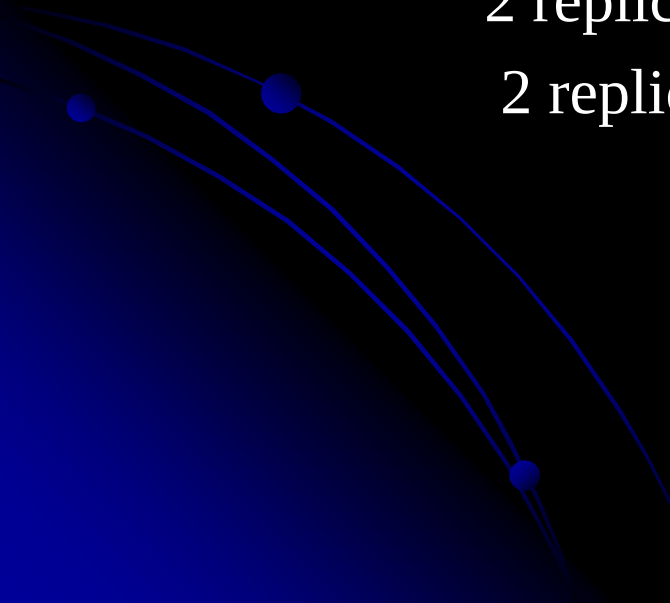
XRF Analysis

Each Lab Received Six Filters for Analysis

2 replicates from December 19 event

2 replicates from February 16 event

2 blank filters



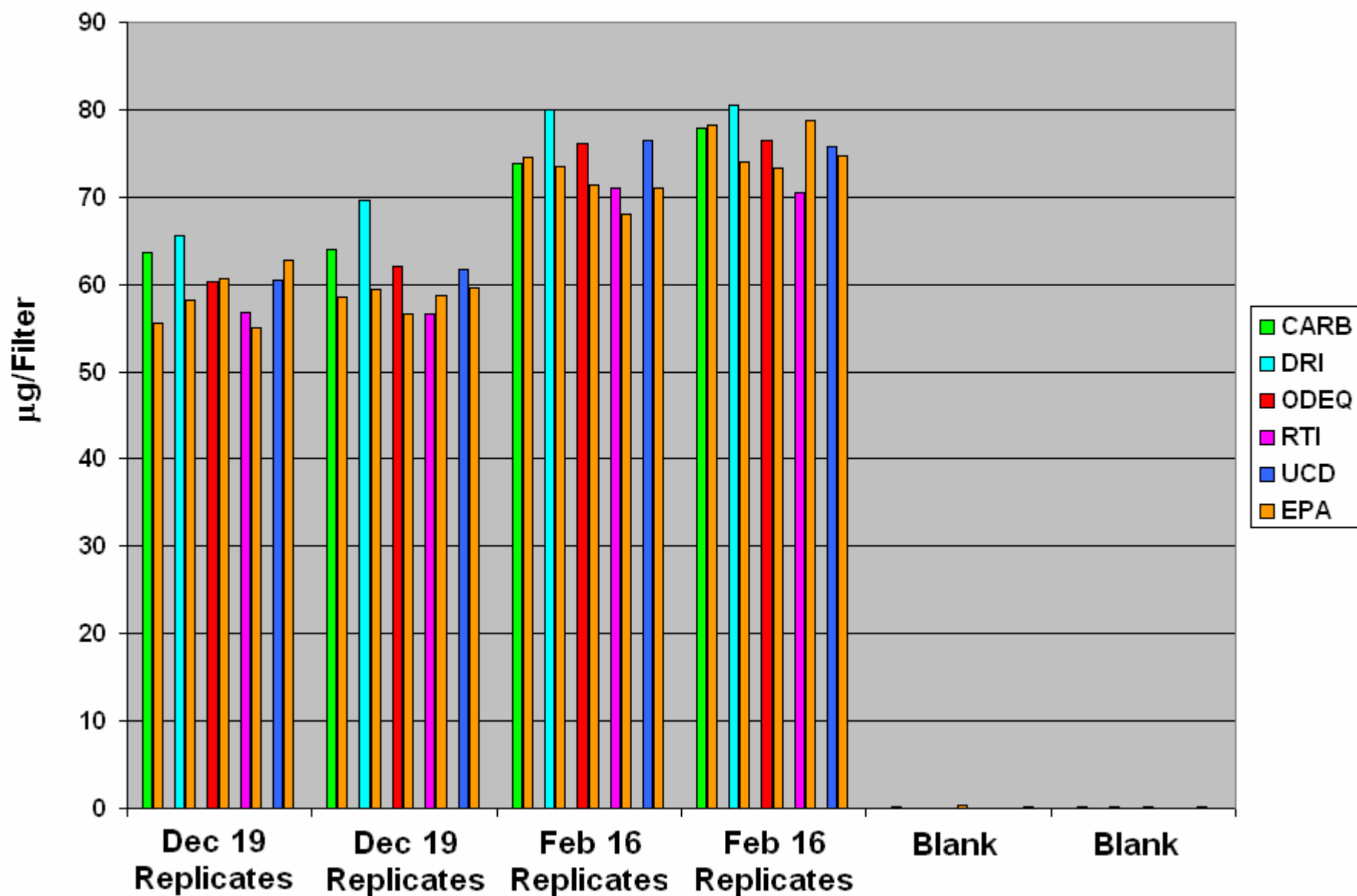
Sampling Schedule for XRF Filters

Filter ID	Sample Start	Event Duration	Gravimetric Mass (µg)	Receiving Lab	Instrument (software)
T05-11565	19-Dec-05	205-hr	923	CARB	Thermo QuanX EC (WinTrace 3.0.2)
T05-11566	19-Dec-05	205-hr	917	CARB	
T06-11614	16-Feb-06	231-hr	746	CARB	
T06-11615	16-Feb-06	231-hr	756	CARB	
T05-11567	19-Dec-05	205-hr	909	DRI	PANalytical Epsilon 5 (E5 version 1.5B)
T05-11568	19-Dec-05	205-hr	941	DRI	
T06-11616	16-Feb-06	231-hr	737	DRI	
T06-11617	16-Feb-06	231-hr	757	DRI	
T05-11569	19-Dec-05	205-hr	907	ODEQ	Kevex 771 WinXRF version 2.41
T05-11570	19-Dec-05	205-hr	894	ODEQ	
T06-11618	16-Feb-06	231-hr	745	ODEQ	
T06-11619	16-Feb-06	231-hr	737	ODEQ	

Sampling Schedule for XRF (cont.)

Filter ID	Sample Start	Event Duration	Gravimetric Mass (μg)	Receiving Lab	Instrument (software)
T05-11571	19-Dec-05	205-hr	898	RTI	Thermo ARL QuanX (WinTrace 4.0)
T05-11572	19-Dec-05	205-hr	925	RTI	
T06-11620	16-Feb-06	231-hr	732	RTI	
T06-11621	16-Feb-06	231-hr	752	RTI	
T05-11573	19-Dec-05	205-hr	935	UCD	UCD design and build (custom software)
T05-11574	19-Dec-05	205-hr	939	UCD	
T06-11622	16-Feb-06	231-hr	765	UCD	
T06-11623	16-Feb-06	231-hr	771	UCD	
All filters were analyzed by EPA multiple times				NERL	LBL build #1 (custom software)

Sulfur Determined by XRF

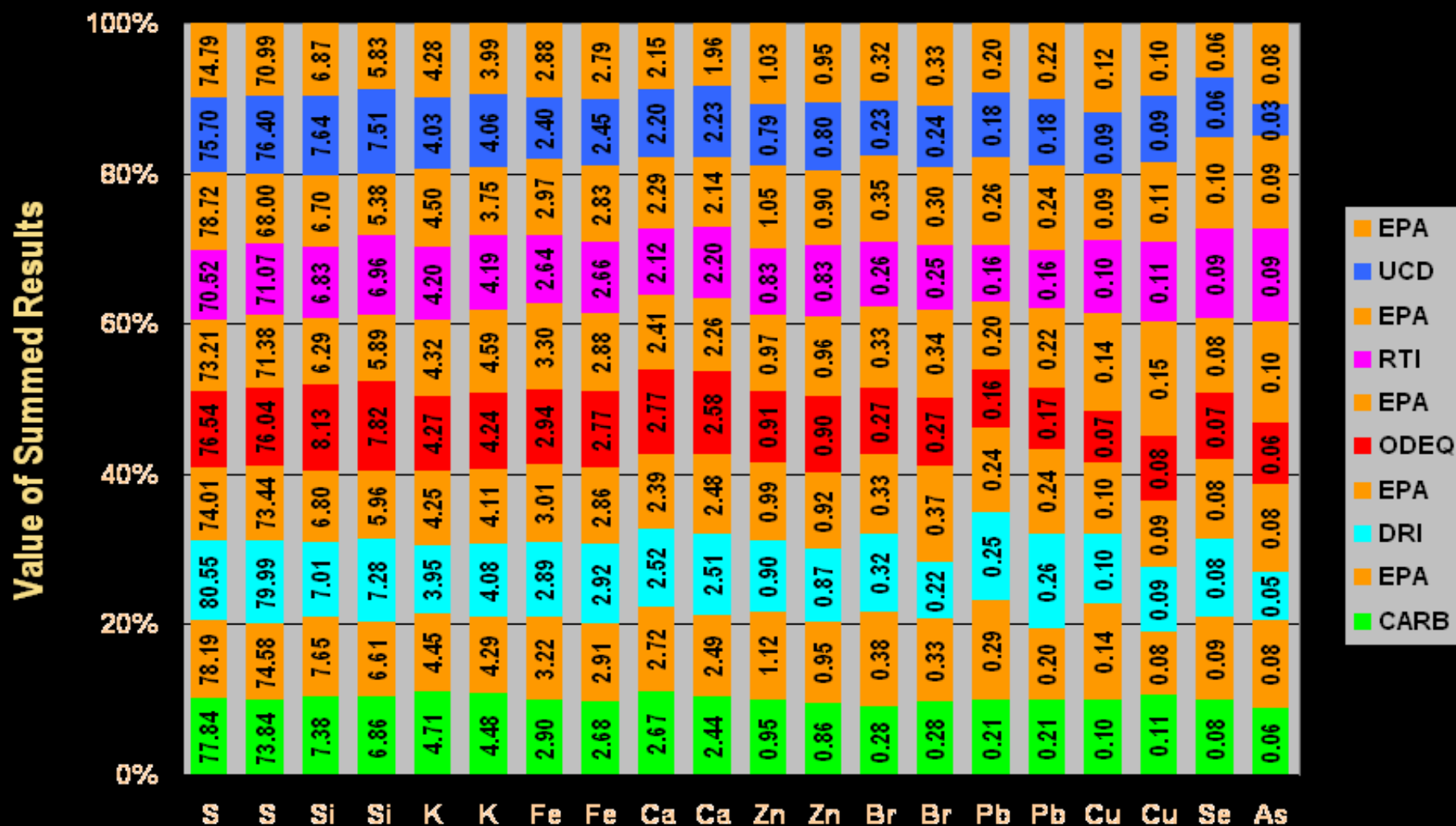


Comparison of XRF Results from Replicates Collected on December 19



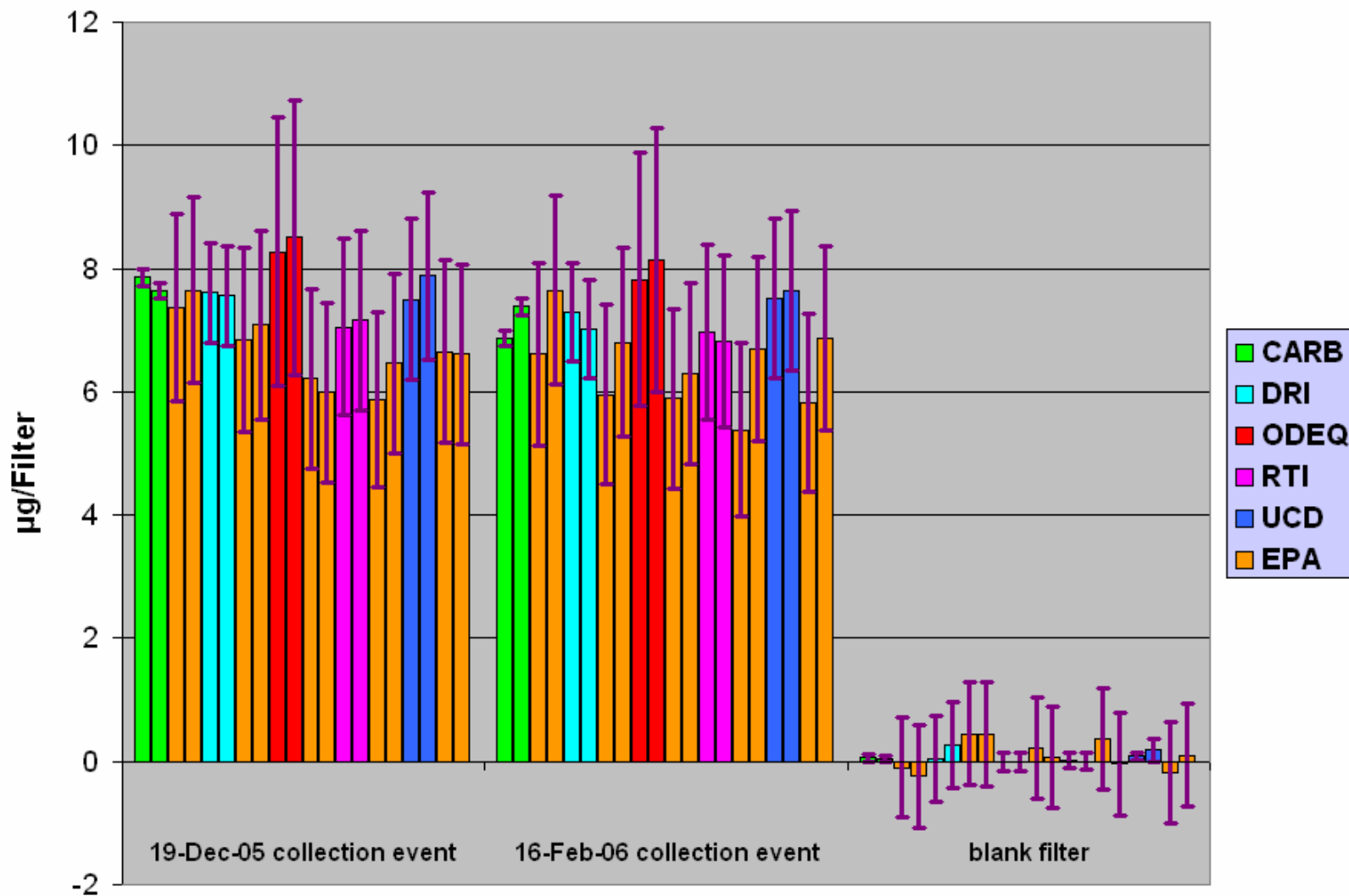
Elements Arranged [from left to right] in Order of Decreasing Conc. (µg/filter)

Comparison of XRF Results from Replicates Collected on February 16

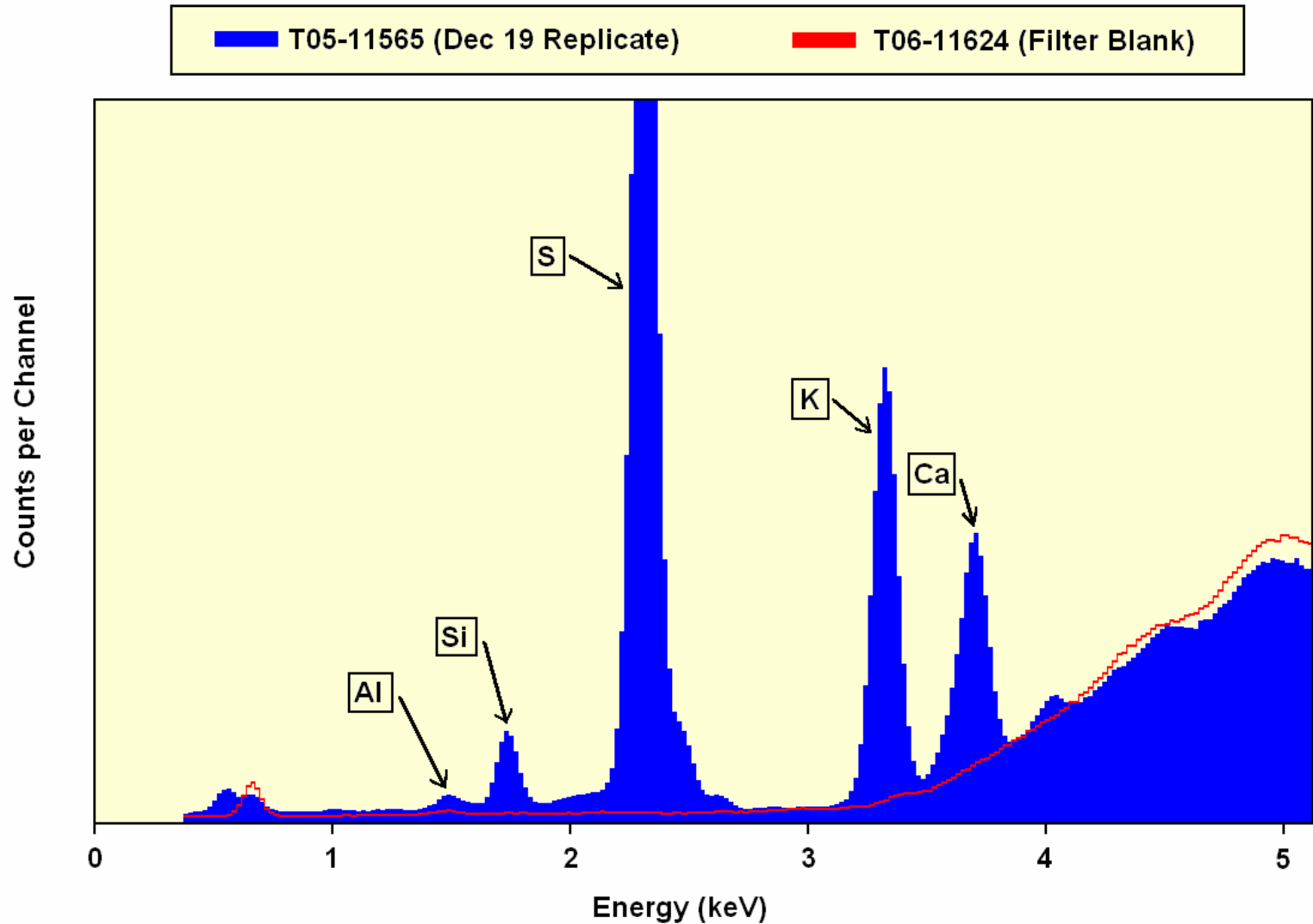


Elements Arranged [from left to right] in Order of Decreasing Conc. (µg/filter)

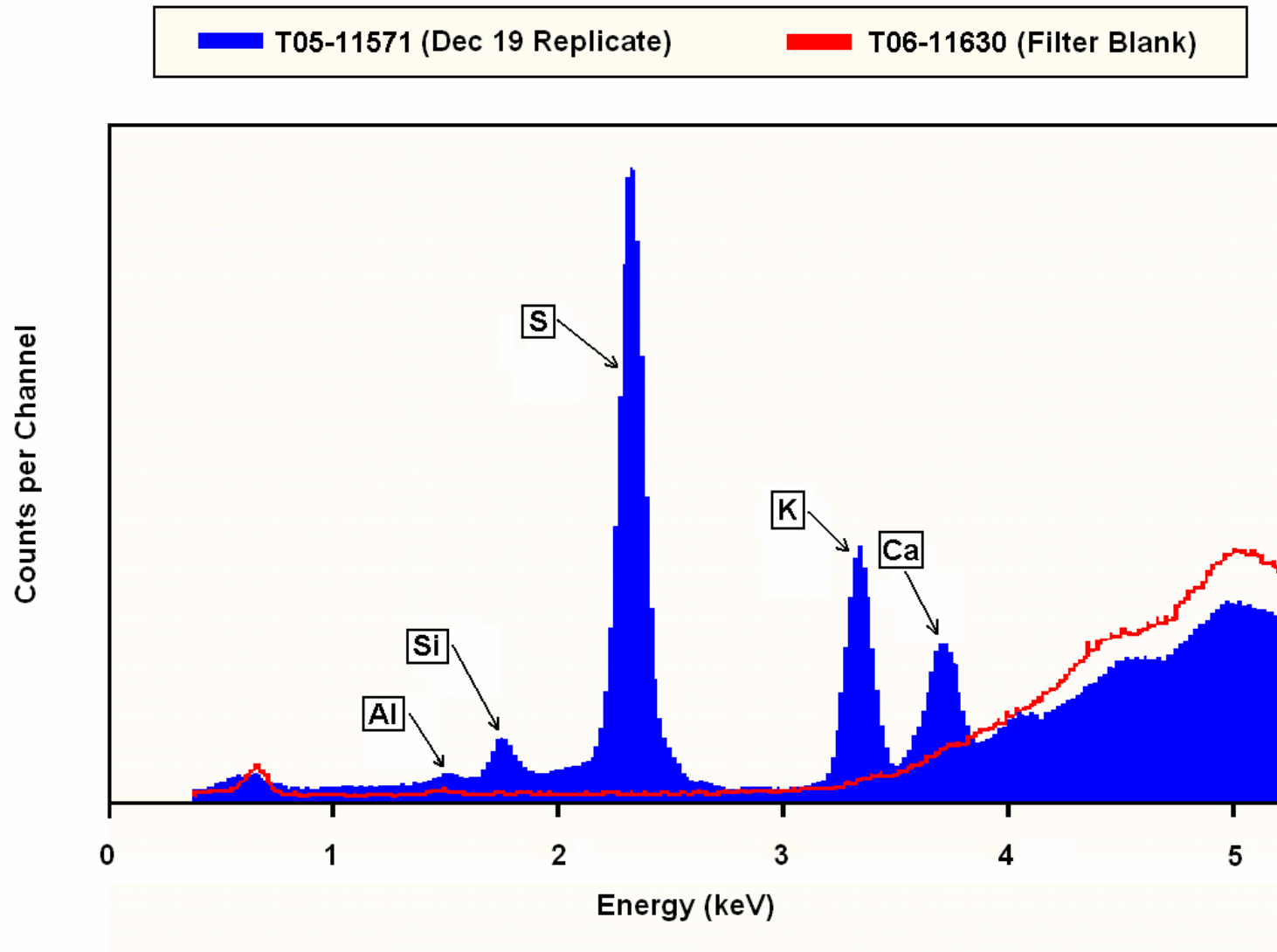
Silicon Results with 3-Sigma Uncertainty



XRF Spectra – CARB Laboratory



XRF Spectra – RTI Laboratory



Problem with Cyclone Corrosion



- A final report for the current study is due later this year.
- Complete report for 2005 study posted at...

www.epa.gov/ttn/amtic/files/ambient/pm25/spec/multilab06.pdf

