

Experimental Inter-comparisons of the Chemical Speciation Laboratories

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US EPA ORIA-Montgomery
Before the
IMPROVE Steering Committee
September 22-23, 2009

US EPA / NAREL



Specific QA Activities at NAREL

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

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
South Coast - Air Quality Management District (AQMD), Diamond Bar, CA	Mass, Ions, Carbon, XRF
Crocker Nuclear Lab, University of California Davis, CA (UCD)	Mass, XRF
EPA's National Air and Radiation Environmental Laboratory (NAREL), Montgomery, AL	Mass, Ions, Carbon

Collocated Met One Samplers



XRF Analysis

Thirty 47-mm filters analyzed at 6 Labs

RTI served as reference lab

Sixteen 25-mm filters analyzed at 3 Labs

UC Davis served as reference lab

How good are the replicates?



80-Hour Replicates from April 24, 2008



120-Hour Replicates from April 28, 2008



100-Hour Replicates from May 5, 2008

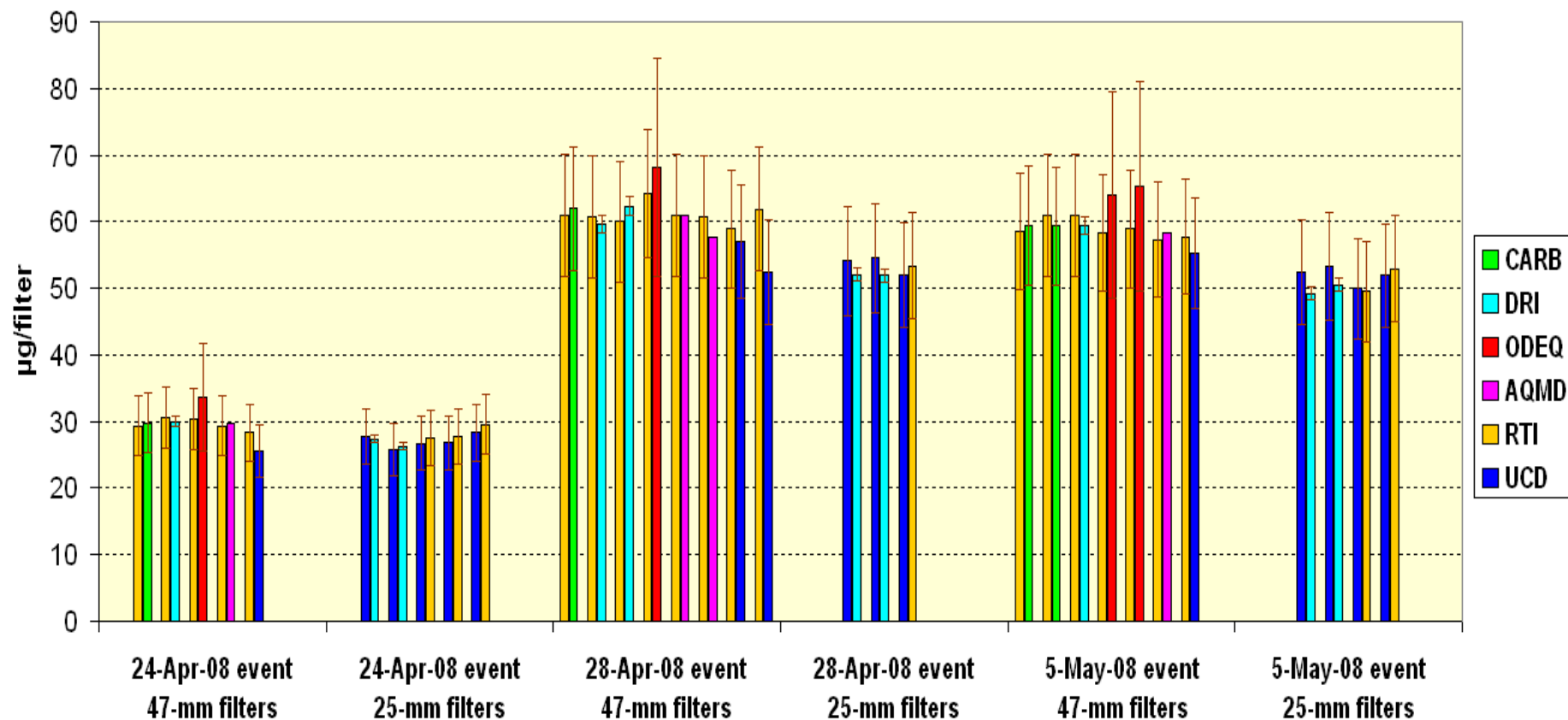


Blank Filters

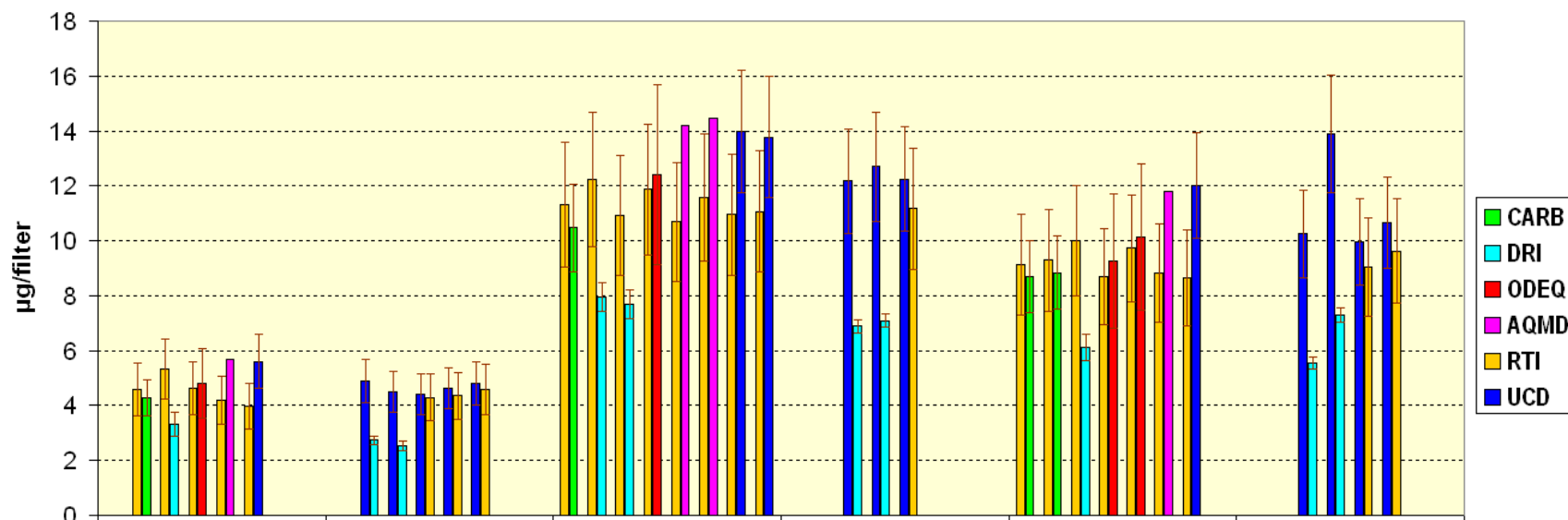
XRF Results for Replicates

Prepared During Three Different Sampling Events

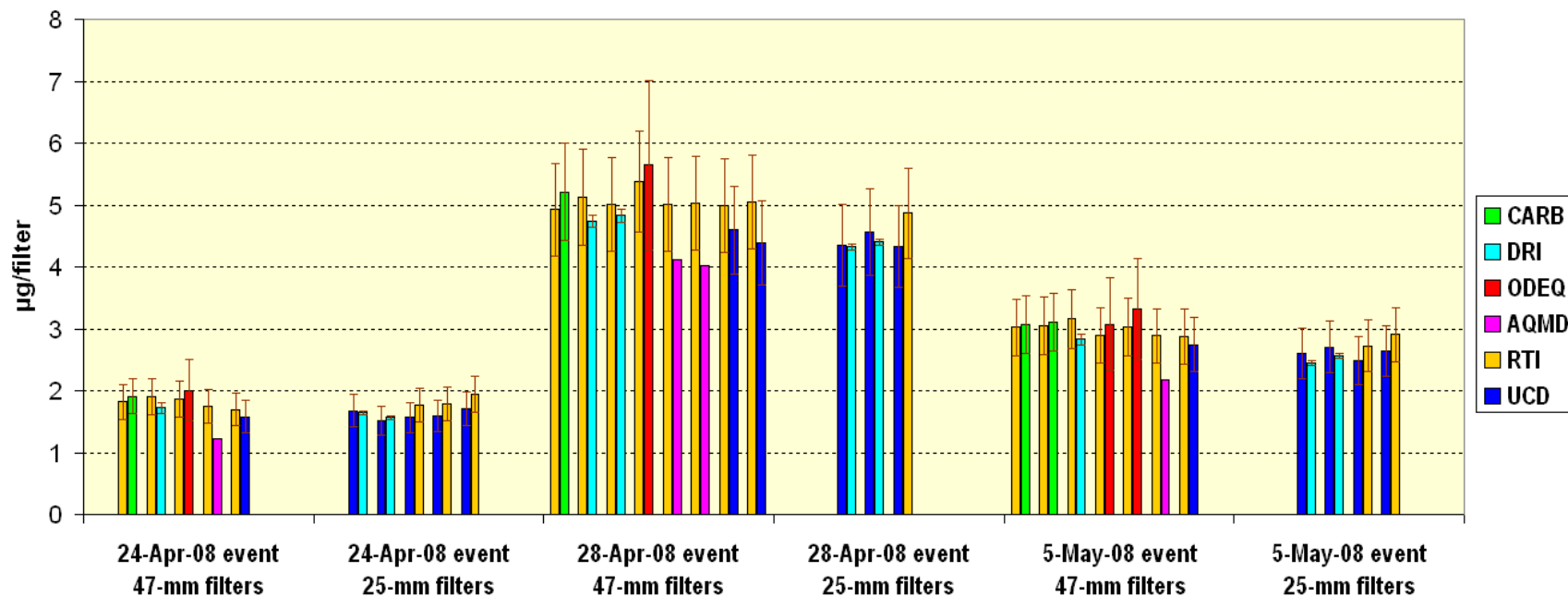
XRF Results for Sulfur Presented with 3-Sigma Uncertainties



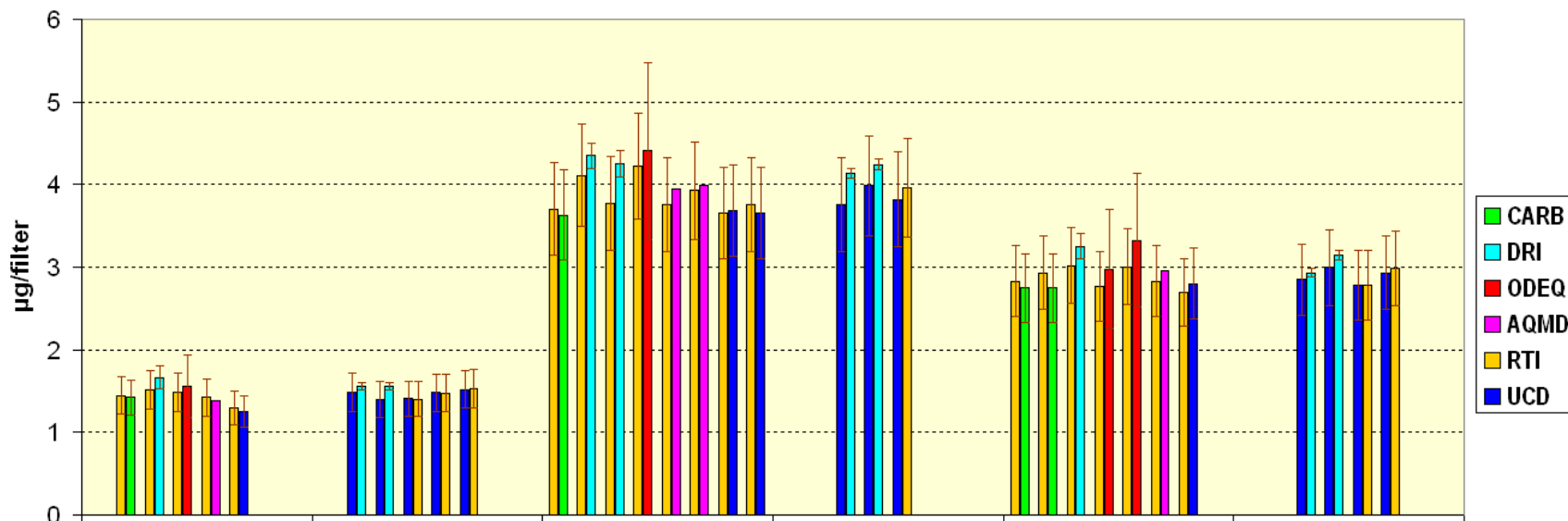
XRF Results for Silicon Presented with 3-Sigma Uncertainties



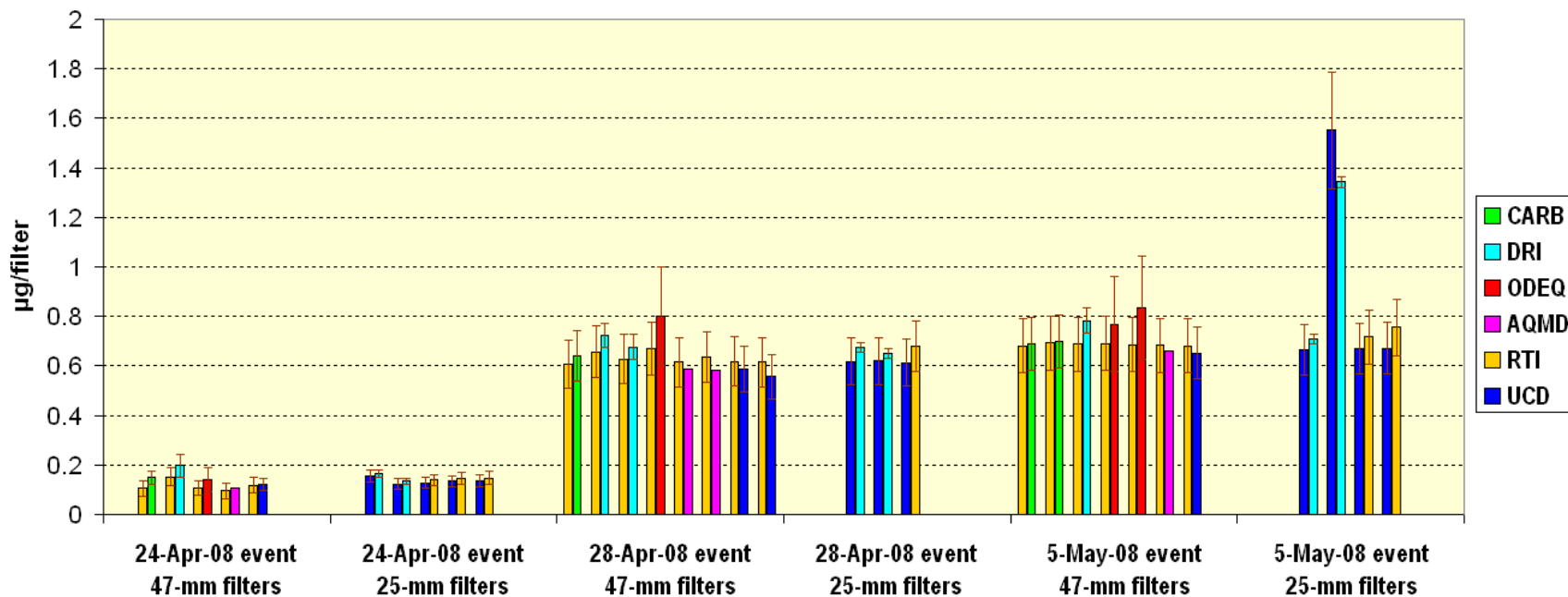
XRF Results for Potassium Presented with 3-Sigma Uncertainties



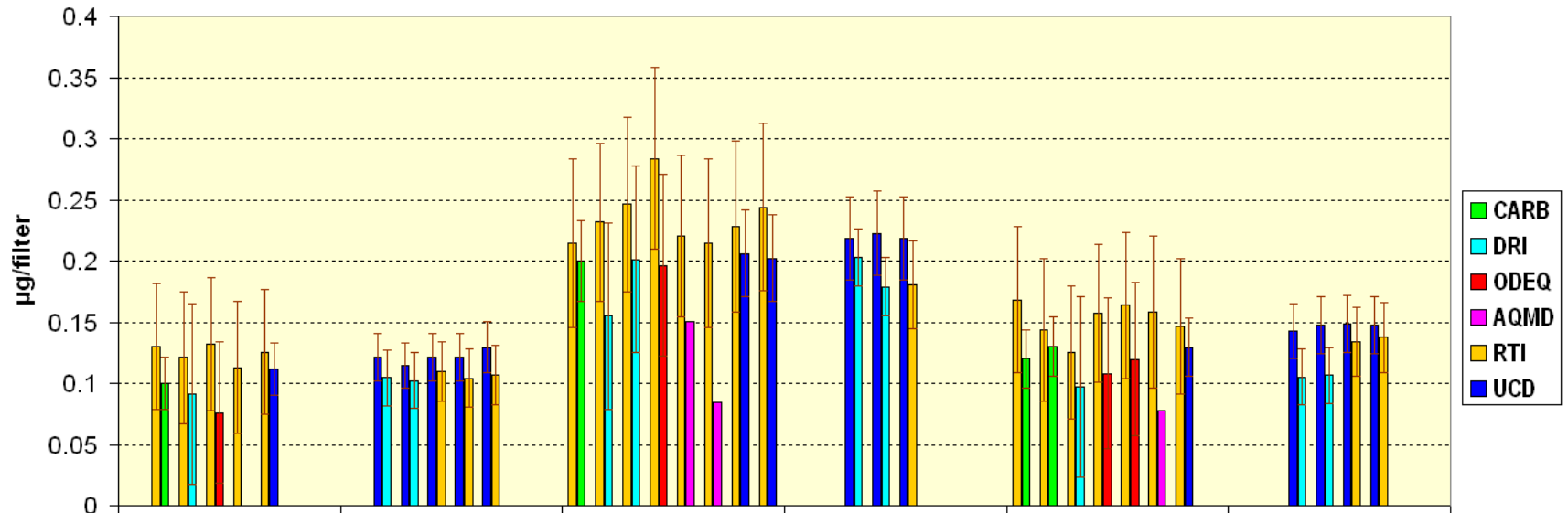
XRF Results for Iron Presented with 3-Sigma Uncertainties



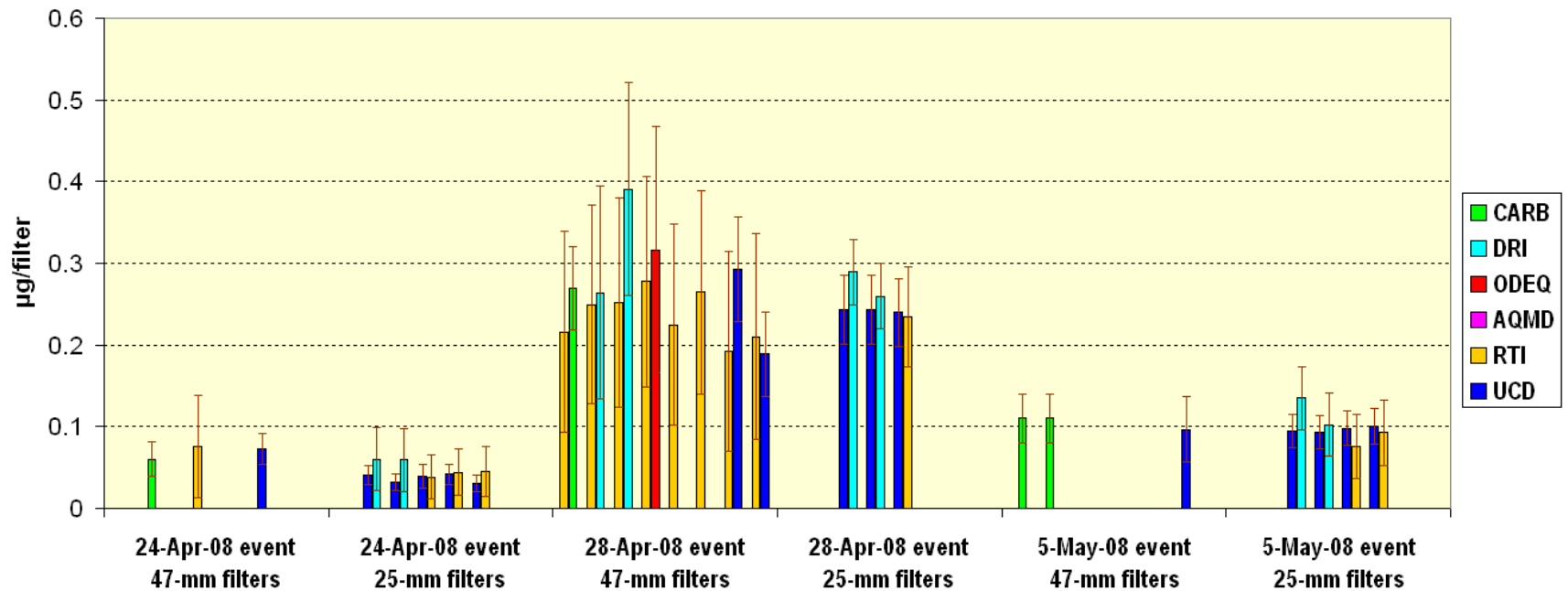
XRF Results for Zinc Presented with 3-Sigma Uncertainties



XRF Results for Bromine Presented with 3-Sigma Uncertainties



XRF Results for Lead Presented with 3-Sigma Uncertainties



TOA Carbon Analysis

Each Lab Received Six Filters for Analysis

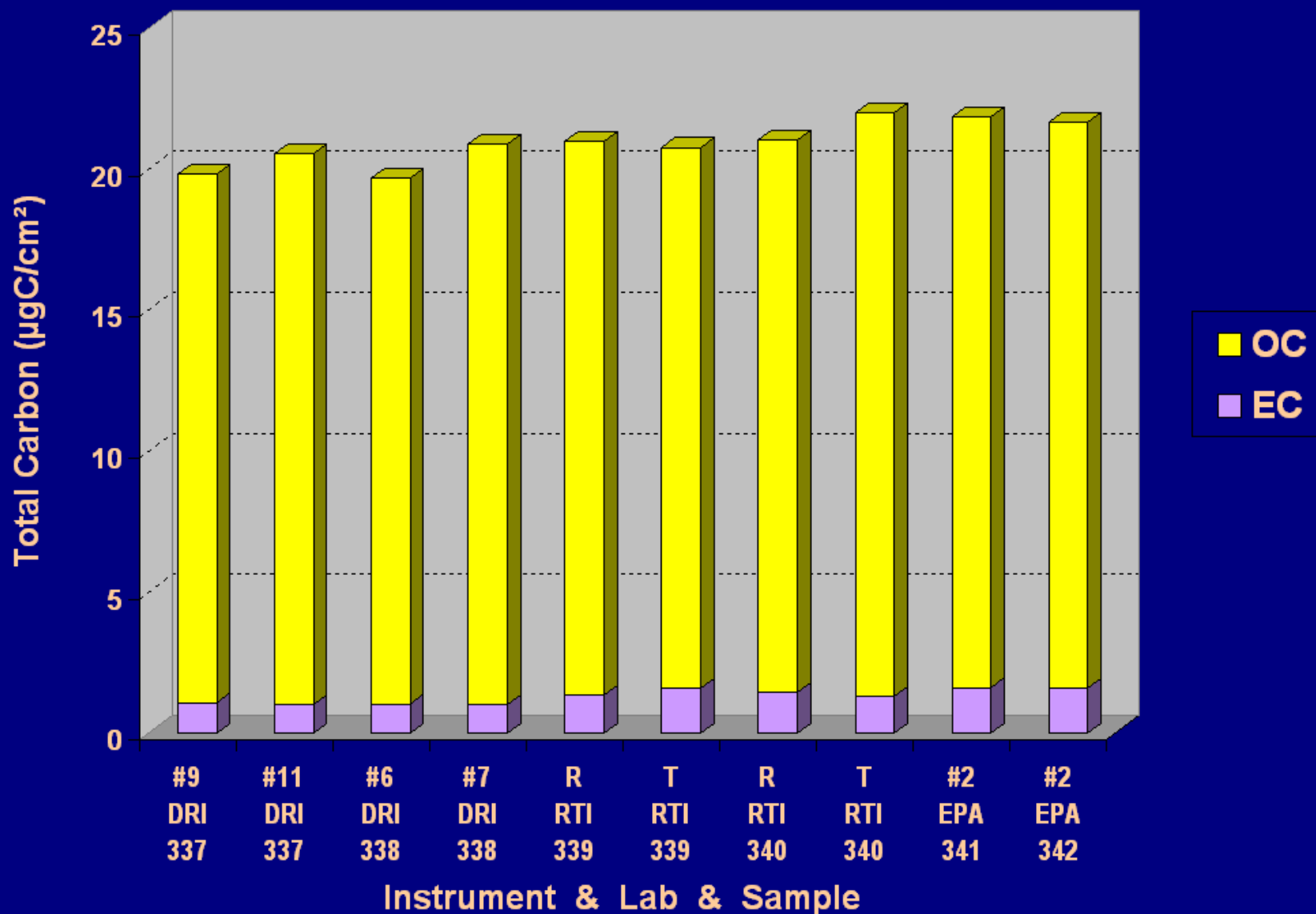
2 replicates from May 27 sampling event

2 replicates from August 29 sampling event

2 blank filters

Analysis of Replicate Quartz Filters - August 29 Event

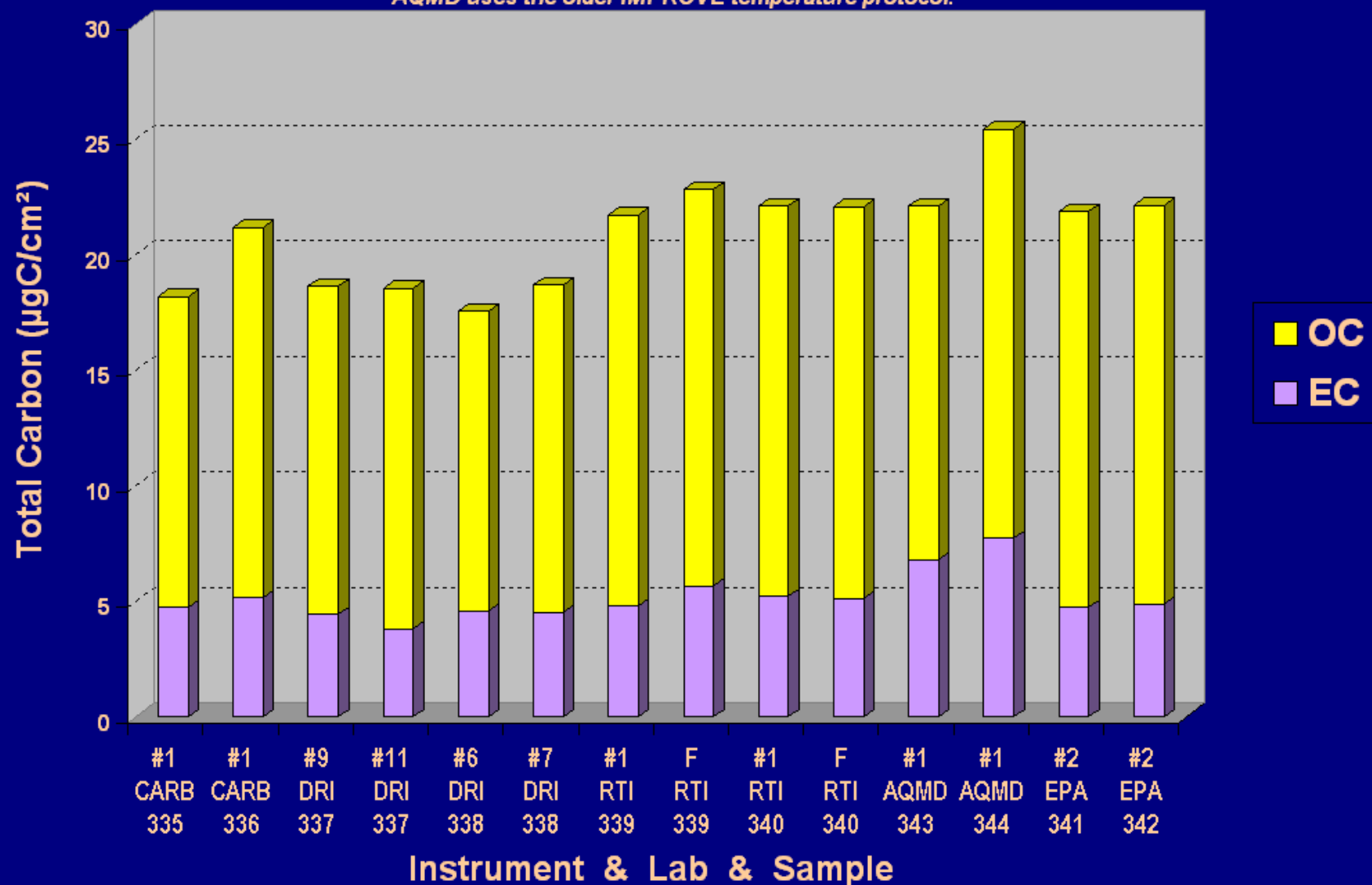
CSN / TOT Method



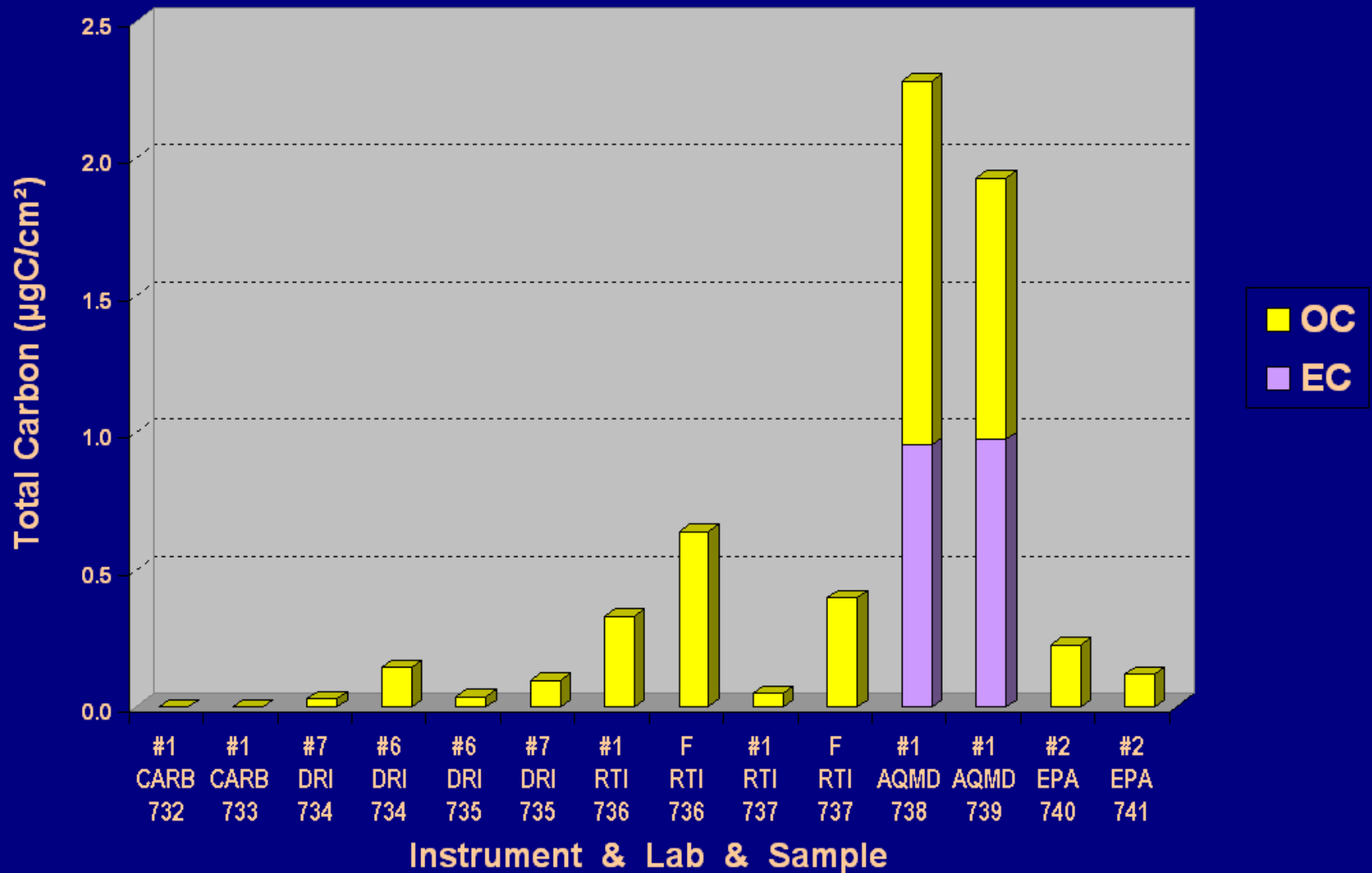
Analysis of Replicate Quartz Filters - August 29 Event

IMPROVE_A / TOR Method... (Except for AQMD)*

**AQMD uses the older IMPROVE temperature protocol.*



Analysis of Blank Quartz Filters IMPROVE_A / TOR Method

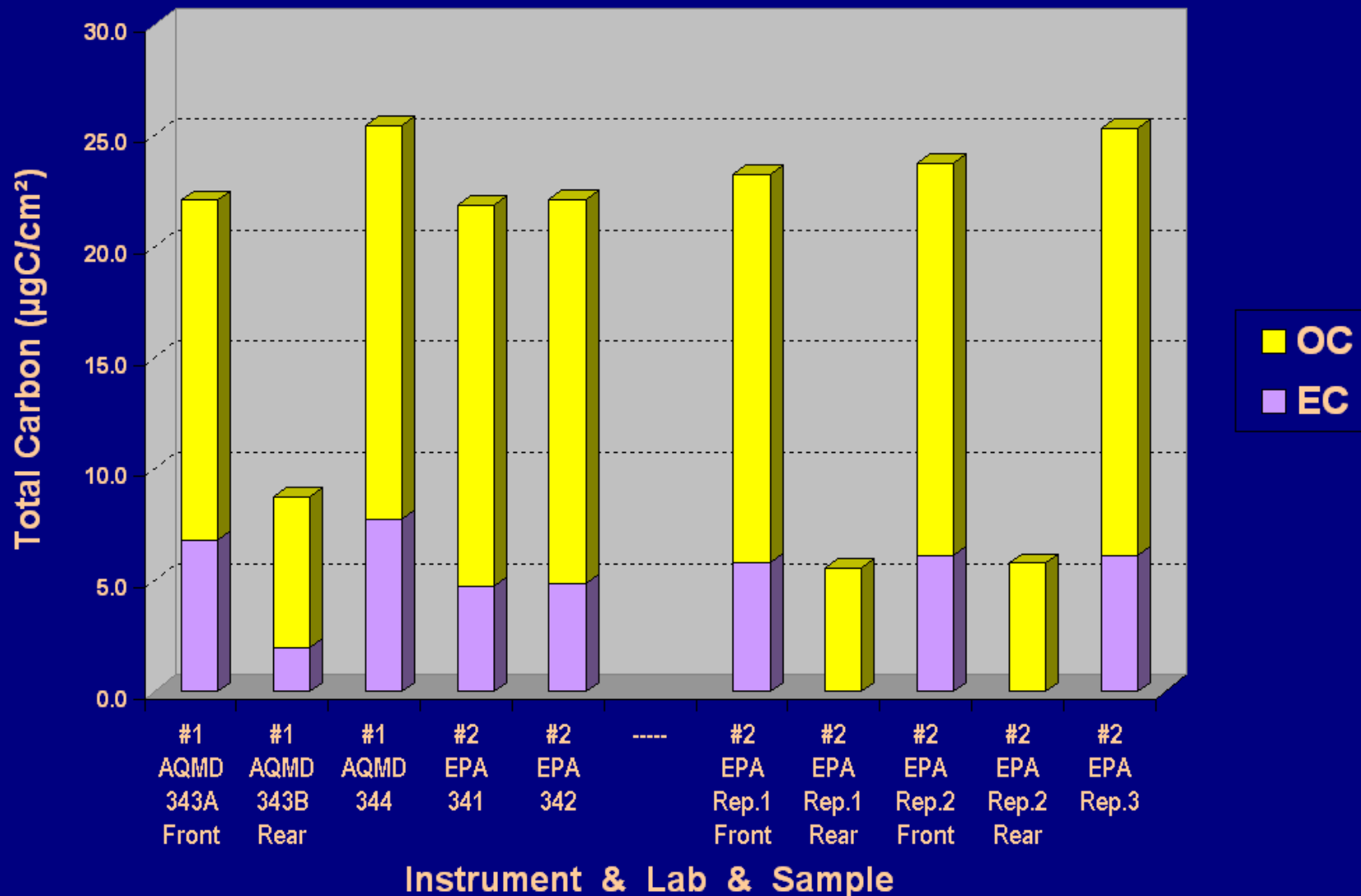


Analysis of Stacked and Single Quartz Filters

IMPROVE_A / TOR Method

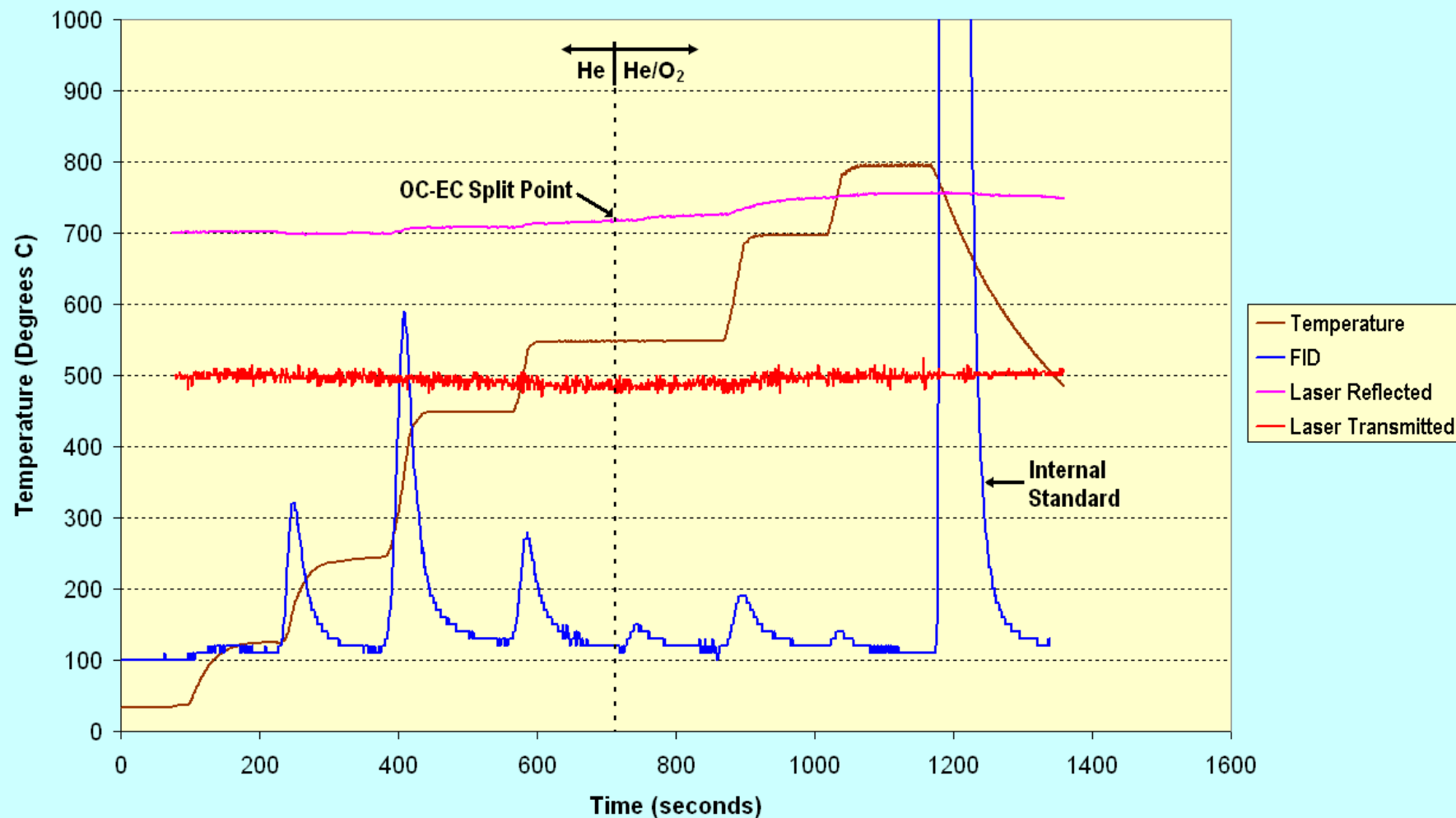
August 29 Replicates

March 23 Replicates



Thermogram of Suspicious Rear Filter

Q08-12343-B Analyzed at AQMD Using the IMPROVE Method & DRI Model 2001 Instrument #1



Ion Chromatographic Analysis

Most Labs Received Six Filters for Analysis

2 replicates from January 23 sampling event

2 replicates from May 12 sampling event

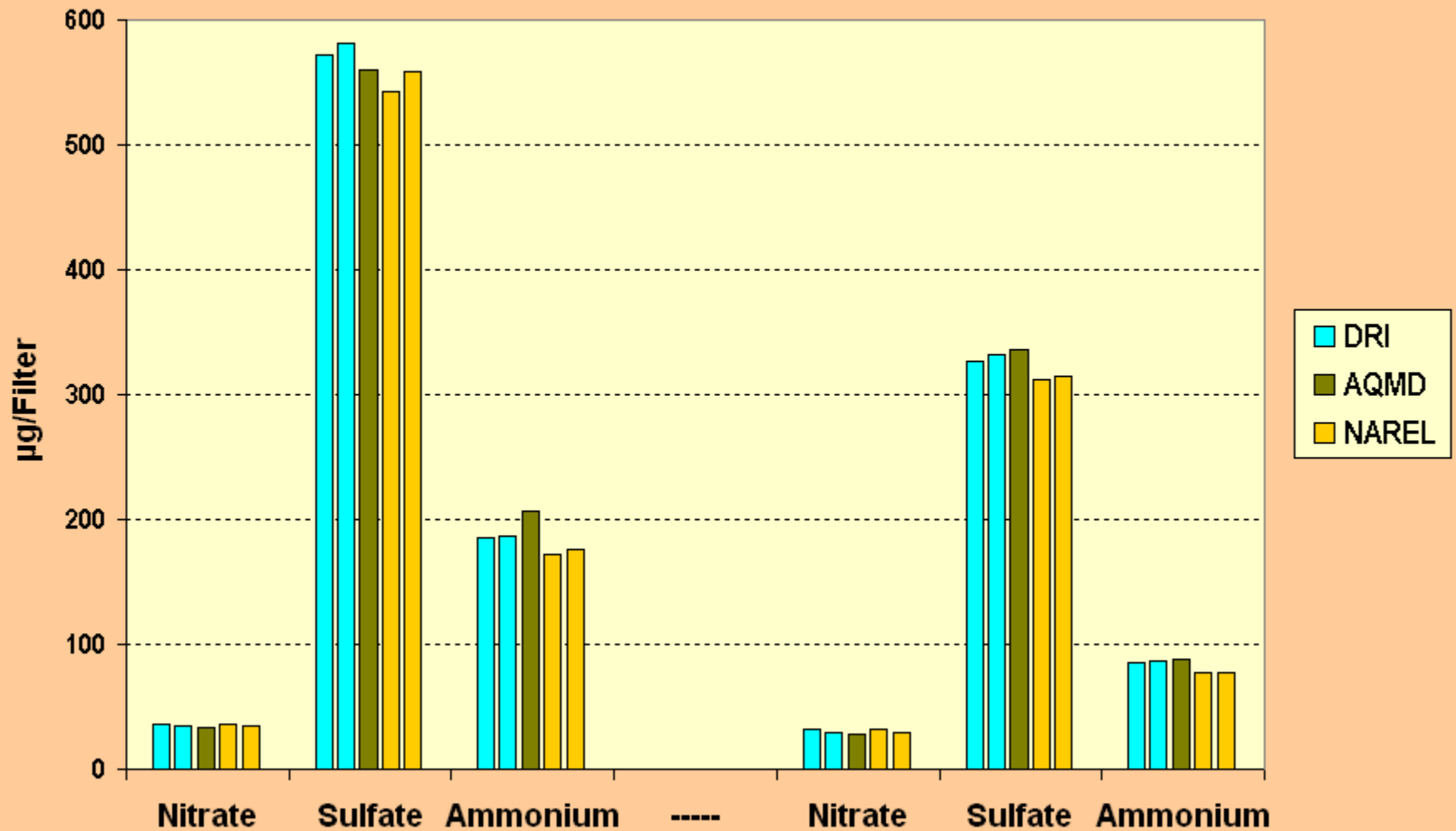
2 blank filters

DRI and RTI received extra filters to test more than one method.

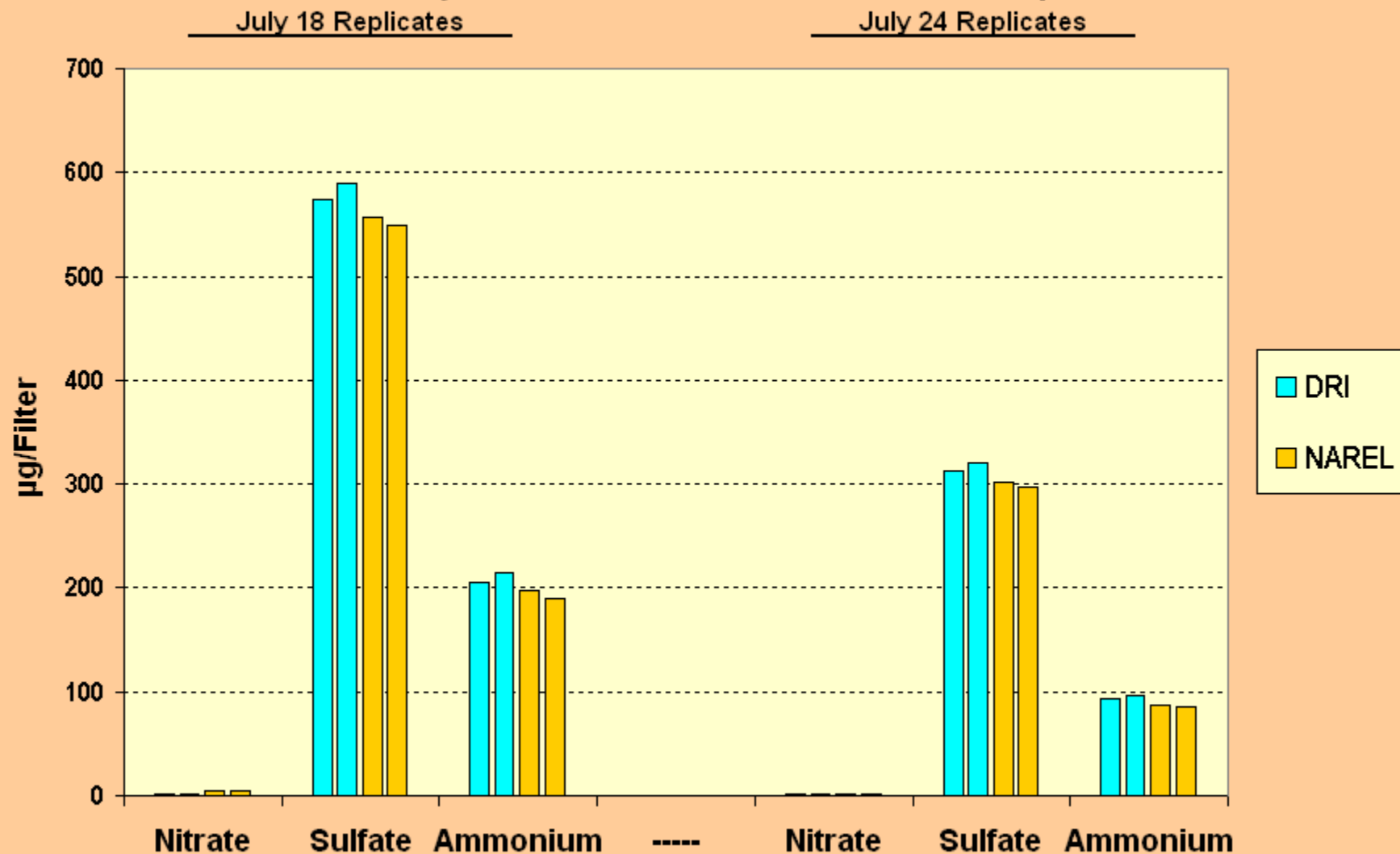
Nylon Filter Analysis, CSN Method, Mid-level Components

July 18 Replicates

July 24 Replicates



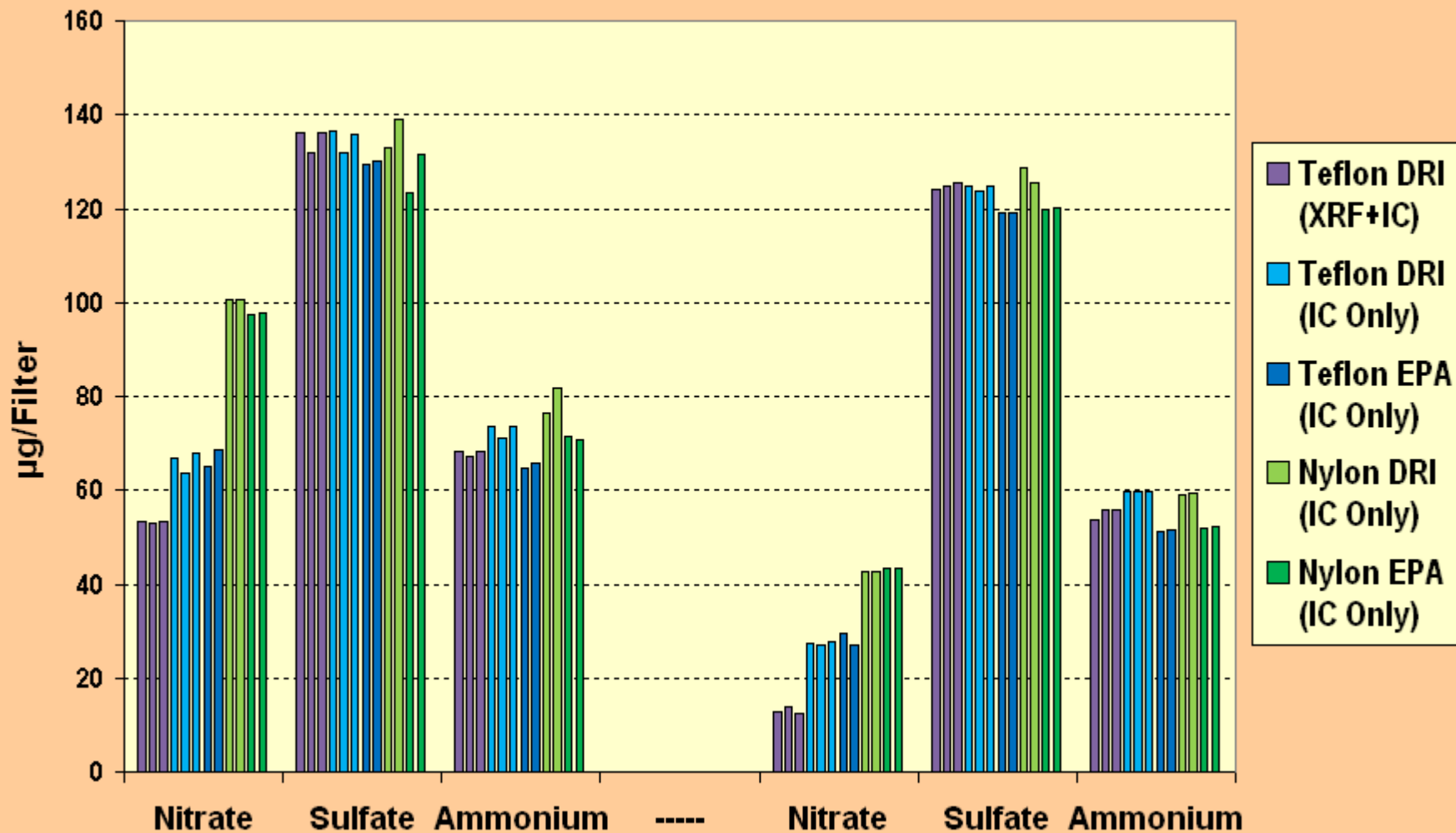
Teflon Filter Analysis, CSN Method, Mid-level Components



Filter Analysis by IC, Mid-level Components

108-Hour Replicates

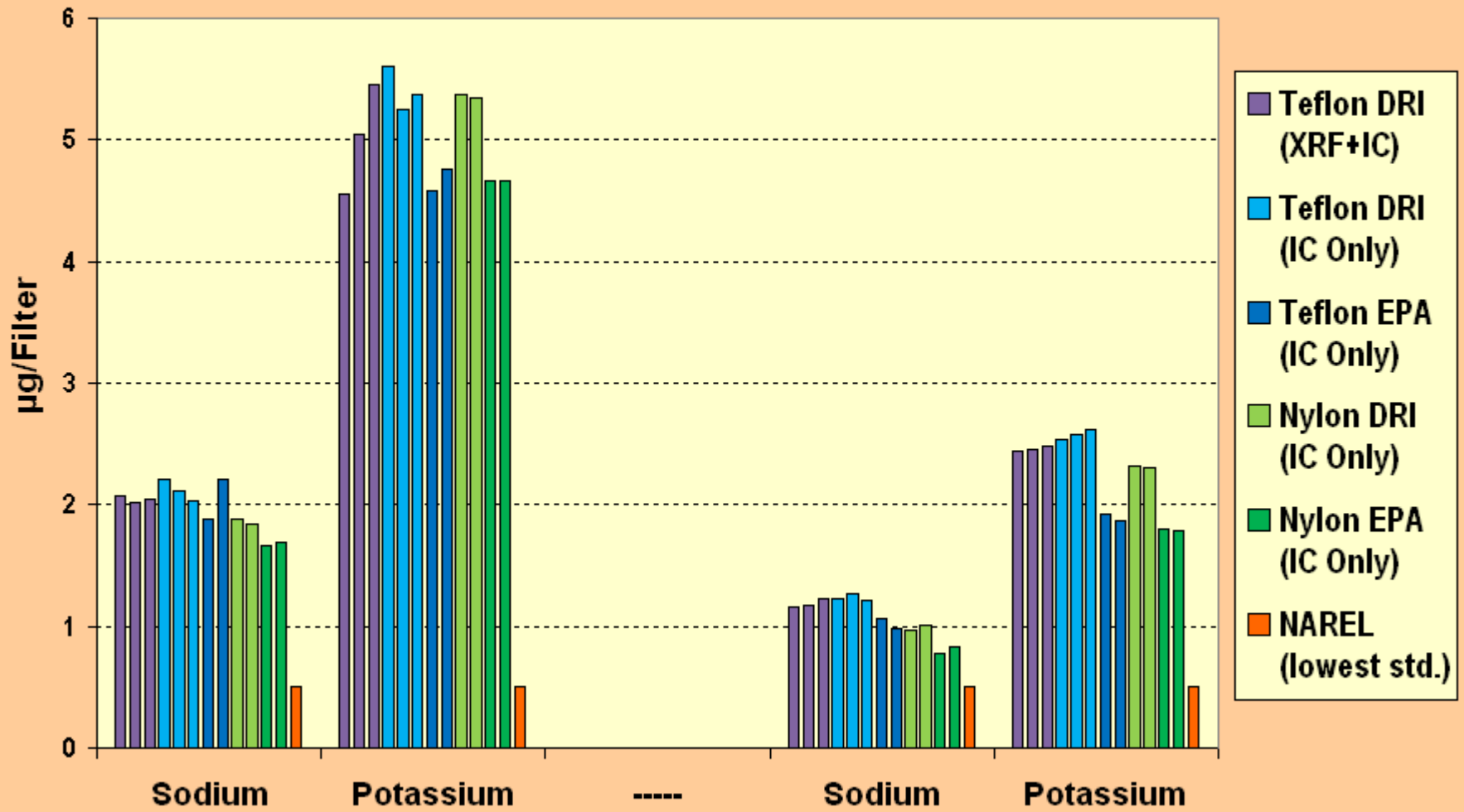
48-Hour Replicates



Filter Analysis by IC, Low-level Components

108-Hour Replicates

48-Hour Replicates

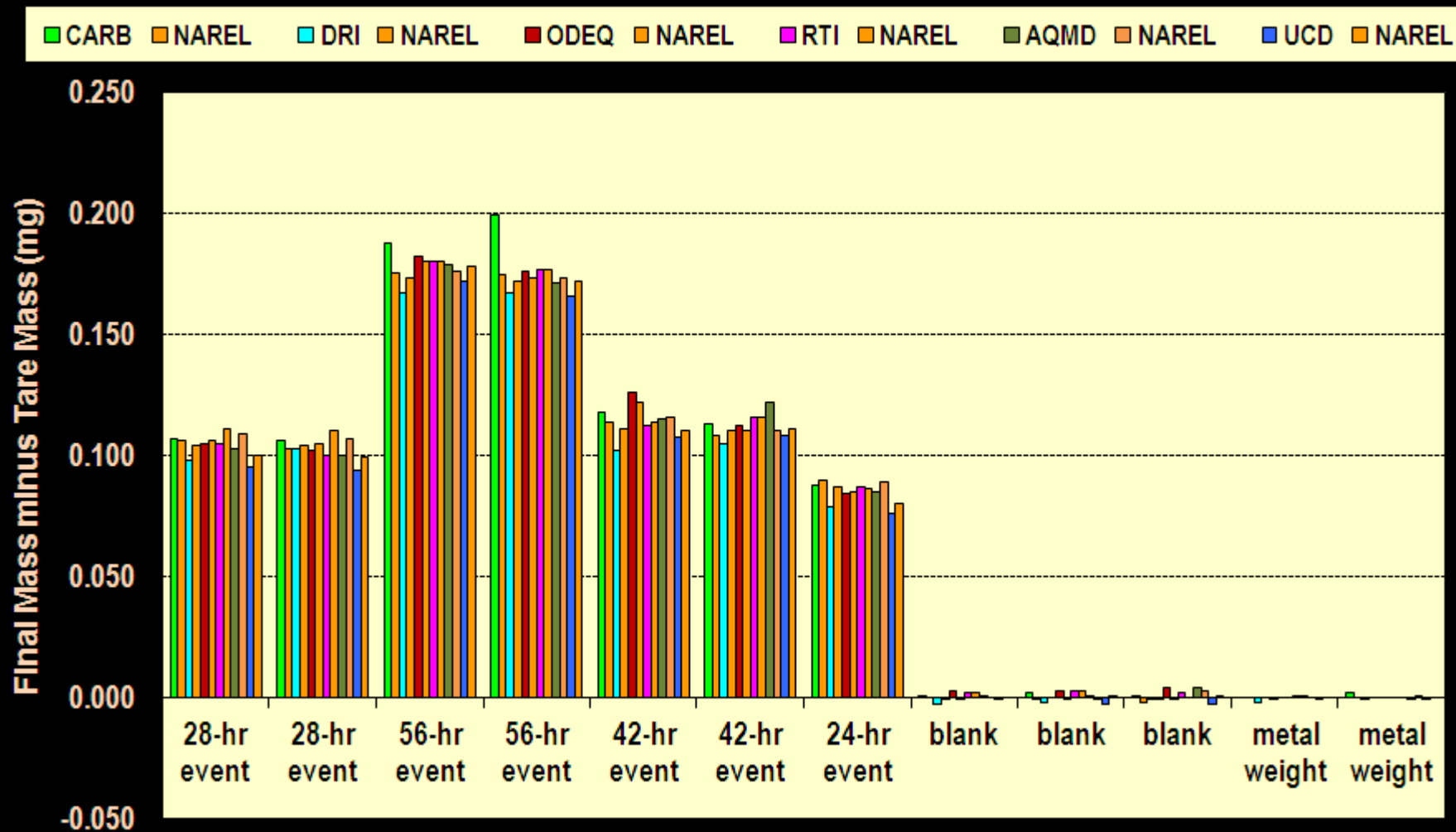


Gravimetric Mass Analysis

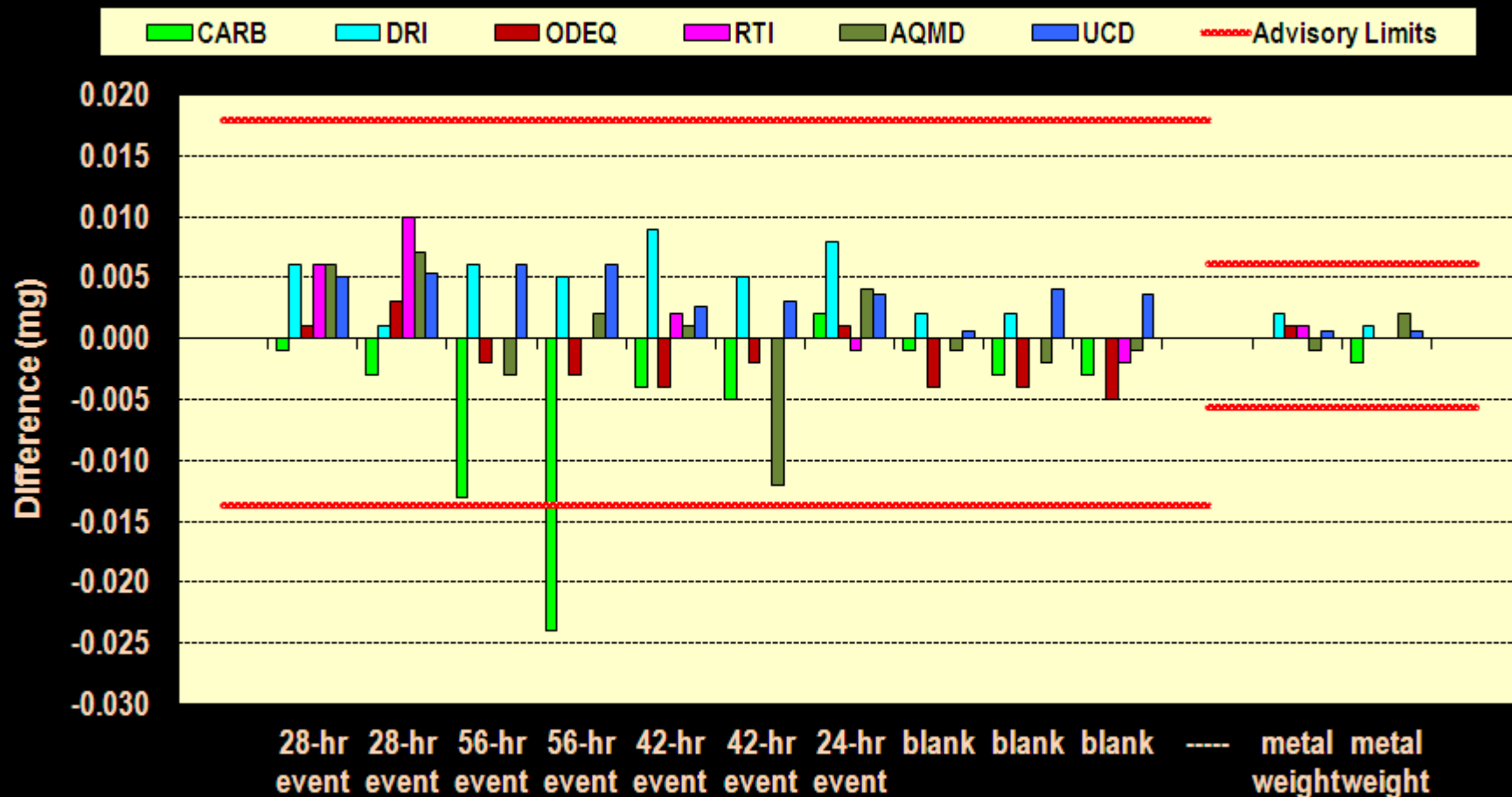
Ten teflon filters and two metallic weights were submitted to each lab for analysis.

NAREL served as reference lab

Captured PM_{2.5} 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)



Questions?