

Speciation Analysis

Low Pressure Separation of As Species using the SC-FAST

Elemental Speciation

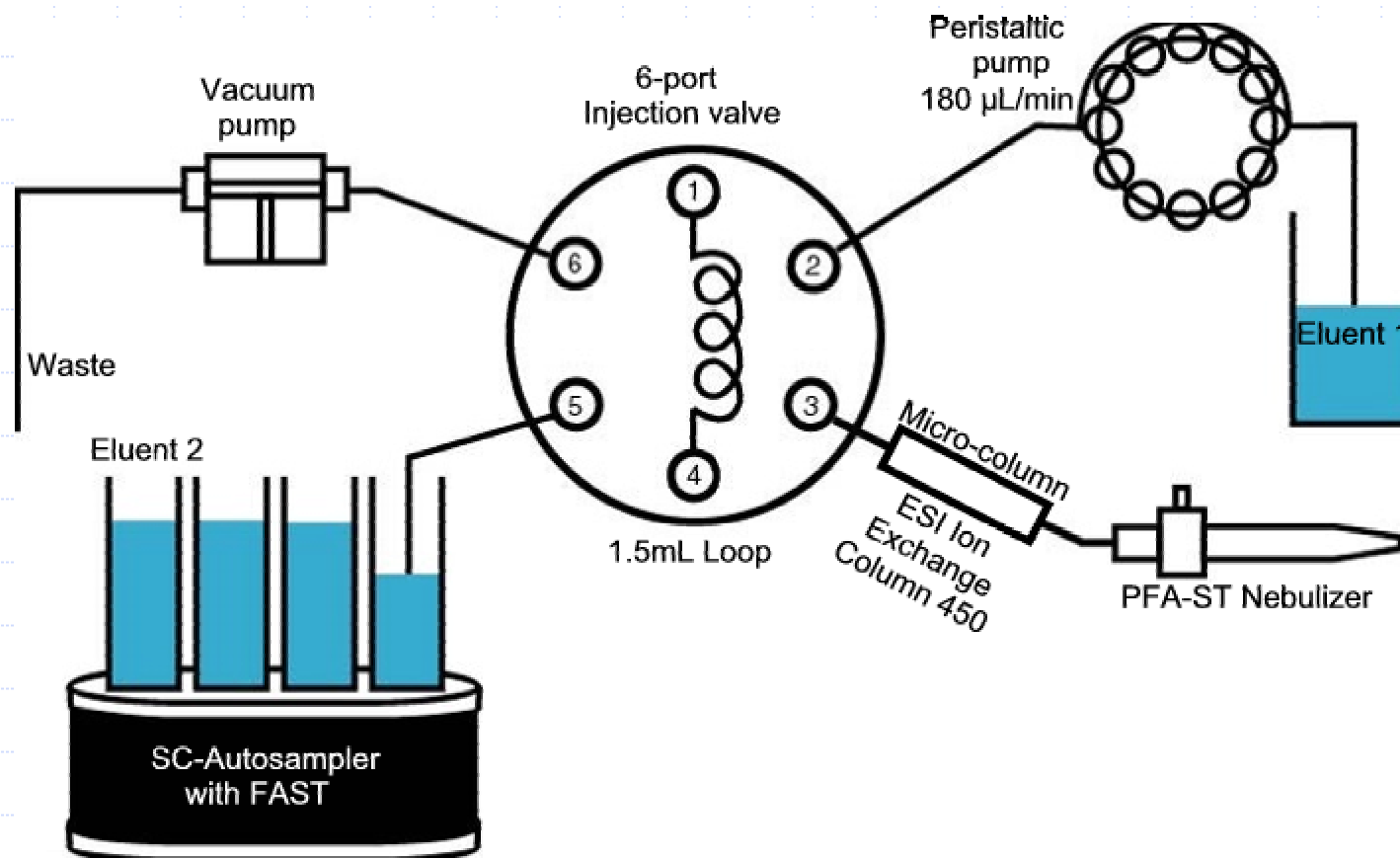
The form an element exists in can control its:

- Toxicity or nutritional value
- Environmental mobility and persistence
- Bio-availability
- Volatility
- Chemical reactivity

As Speciation

- Inorganic As is the main compound of arsenic in water, soil and sediment
- Both As(III) & As(V) are highly toxic with As(III) being particularly poisonous
- In living organisms, arsenic is methylated – detoxifying it
- MMA & DMA have intermediate toxicity
- AsBet & AsCho are considered non-toxic

SC-FAST for As Speciation Analysis



Instrument Parameters

| Element 2 High Resolution ICP-MS | |
|----------------------------------|-----------------|
| Cool Gas | 16.50 L/min |
| Auxiliary Gas | 0.94 L/min |
| Sample Gas | 0.790 L/min |
| Additional Gas | 0.215 L/min |
| RF Power | 1550 W |
| Pump Speed | 13 rpm |
| Liquid Flow Rate | 180 μ L/min |
| Resolution | Low |



Instrument Parameters

SC-FAST Set-up

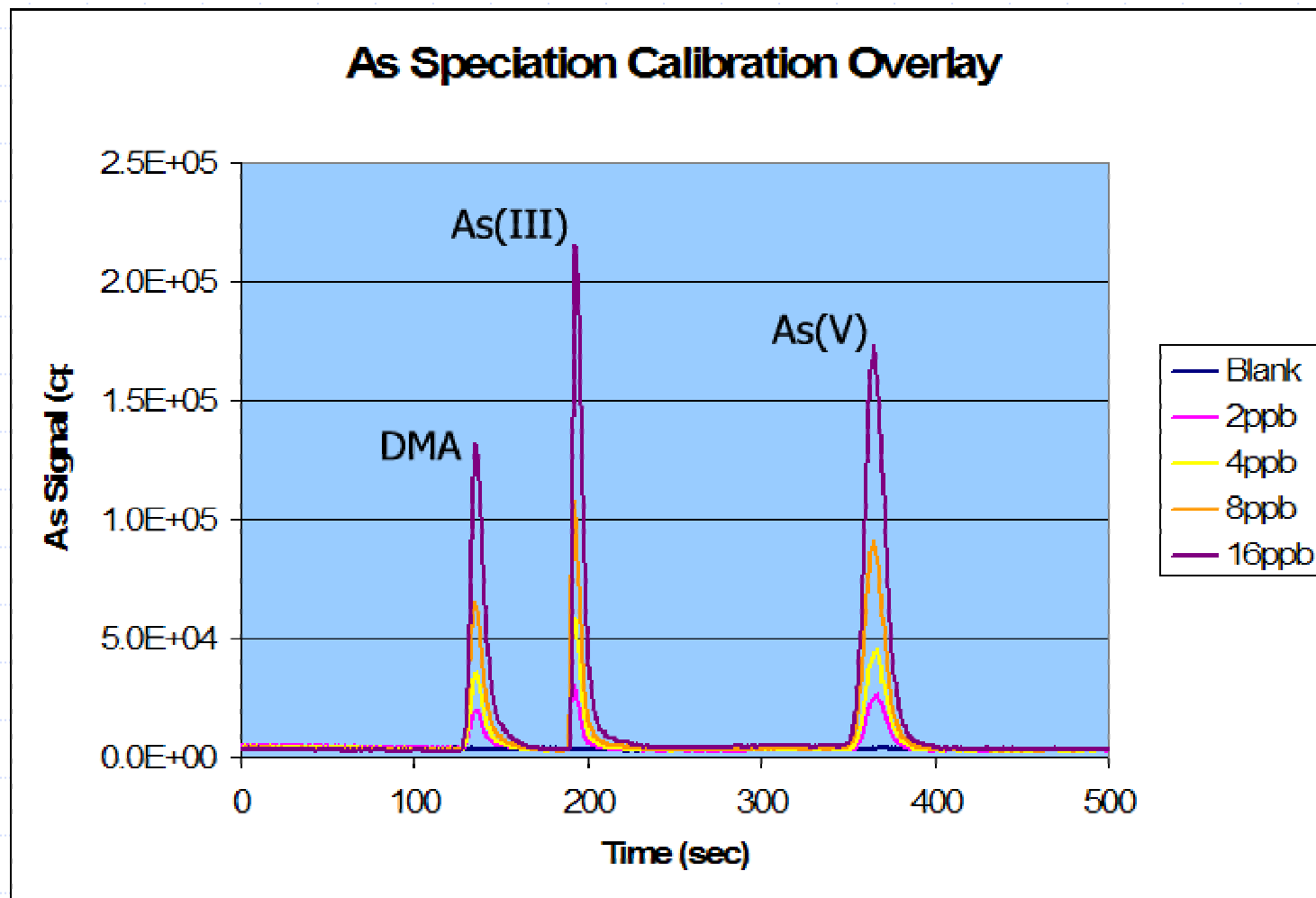
| | |
|----------------------|----------------------|
| Spray Chamber | Quartz Cyclonic |
| Nebulizer | PFA-ST |
| Pump Tubing | Green-Orange |
| Column | ESI Ion Exchange 450 |
| Loop Volume | 1.5 mL |
| Loop Fill Time | 10 s |
| Sample Inject Time | 3 s (9 μ L) |
| Eluent 1 Inject Time | 100 s |
| Eluent 2 Inject Time | 545 s |

Separation & Calibration Studies

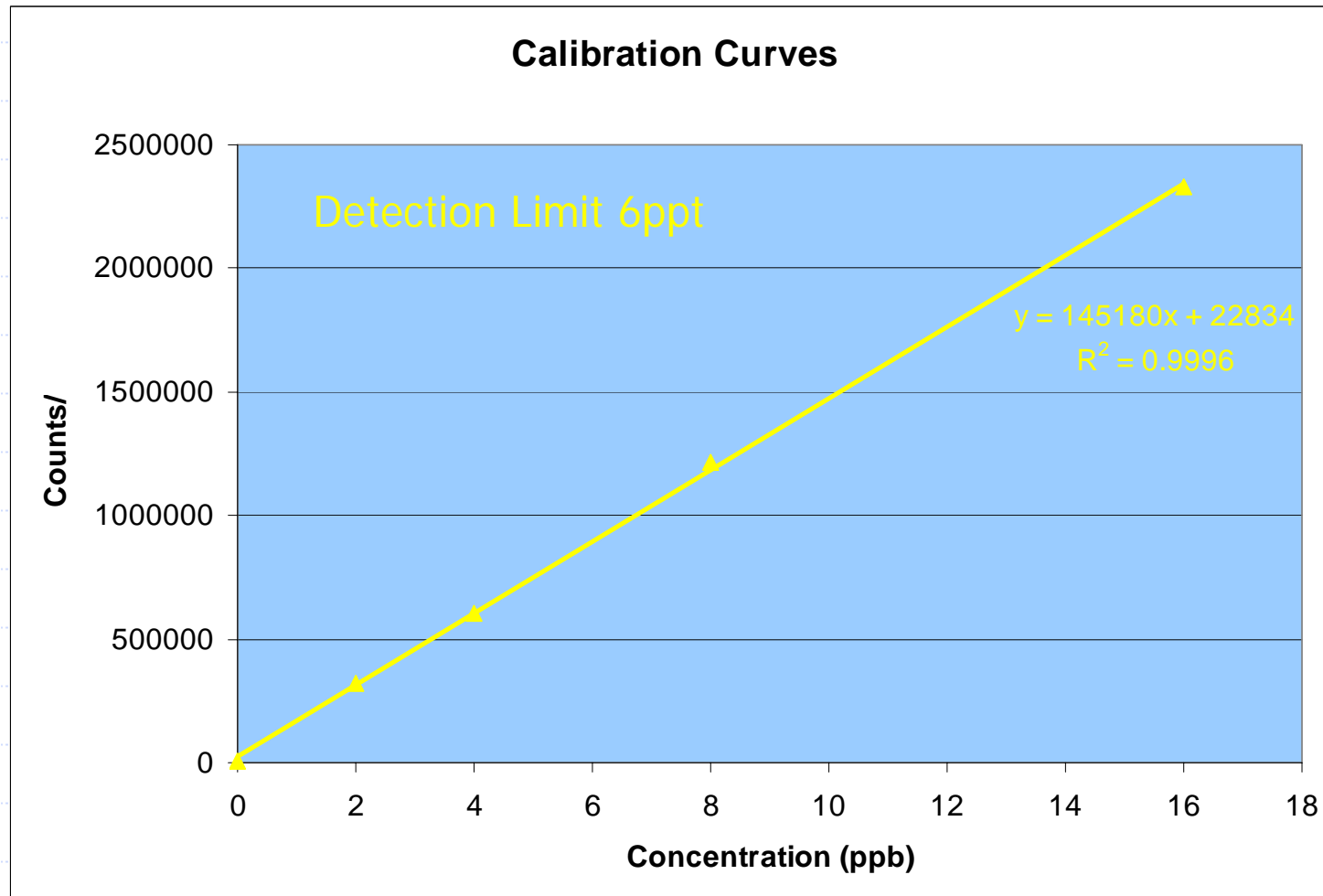


- Step Gradient Elution
- DMA, As(III) & As(V) separated
- Element 2 Time Resolved Software

DMA / As(III) / As(V) Separation

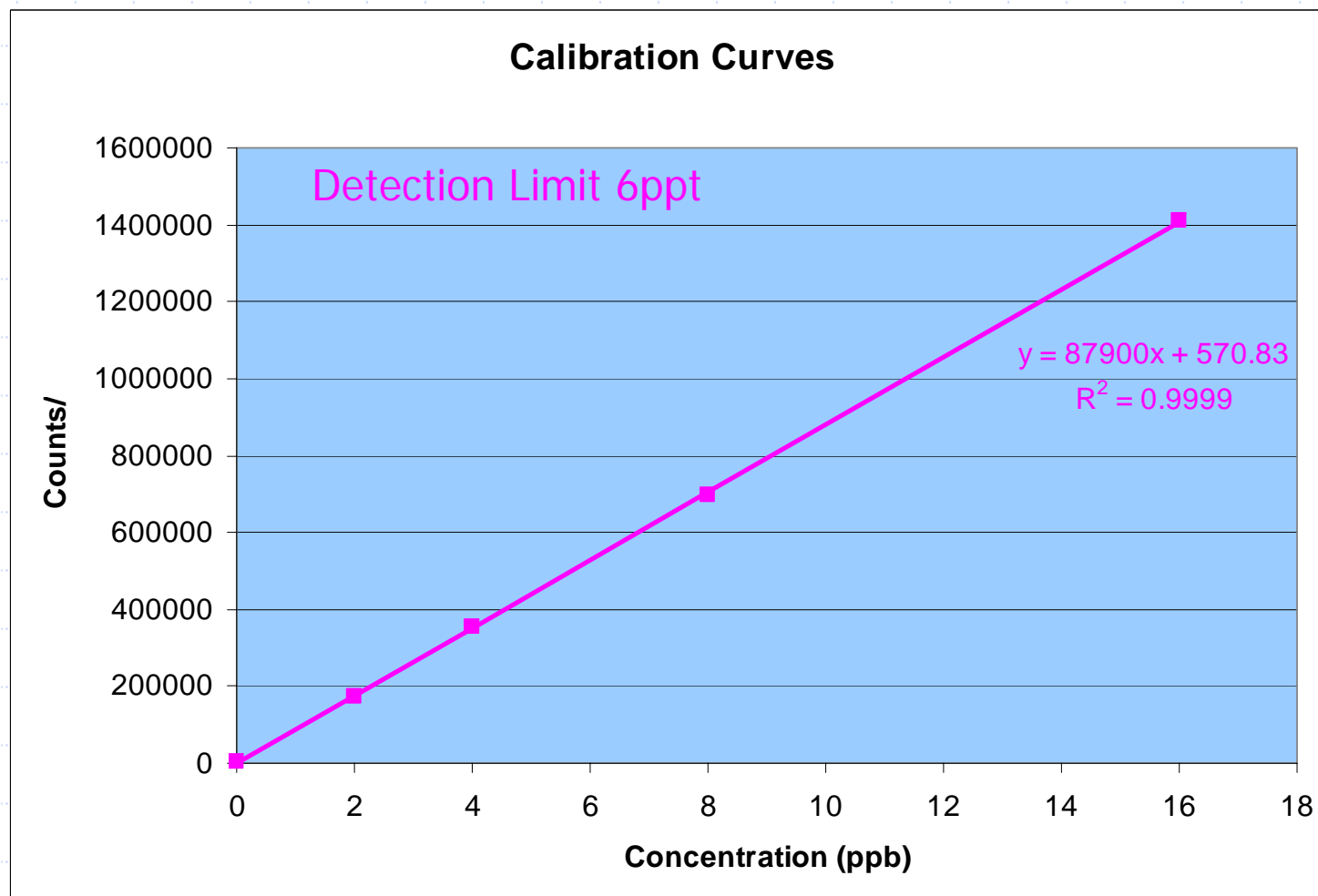


Calibration Studies - As(V)



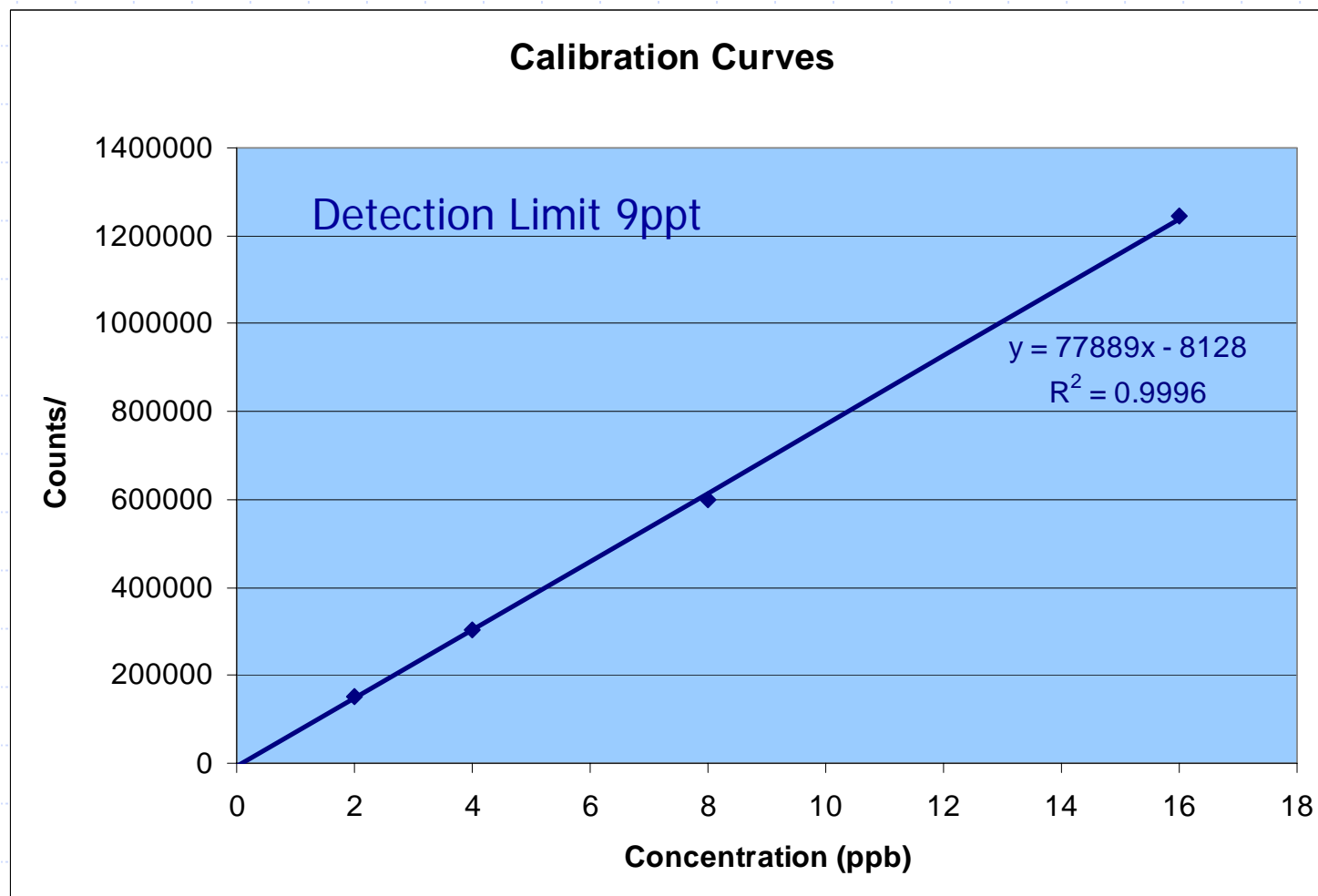
- 0, 2, 4, 8 & 16ppb linear calibration
- 9 μ L Injection Volume

Calibration Studies - As(III)



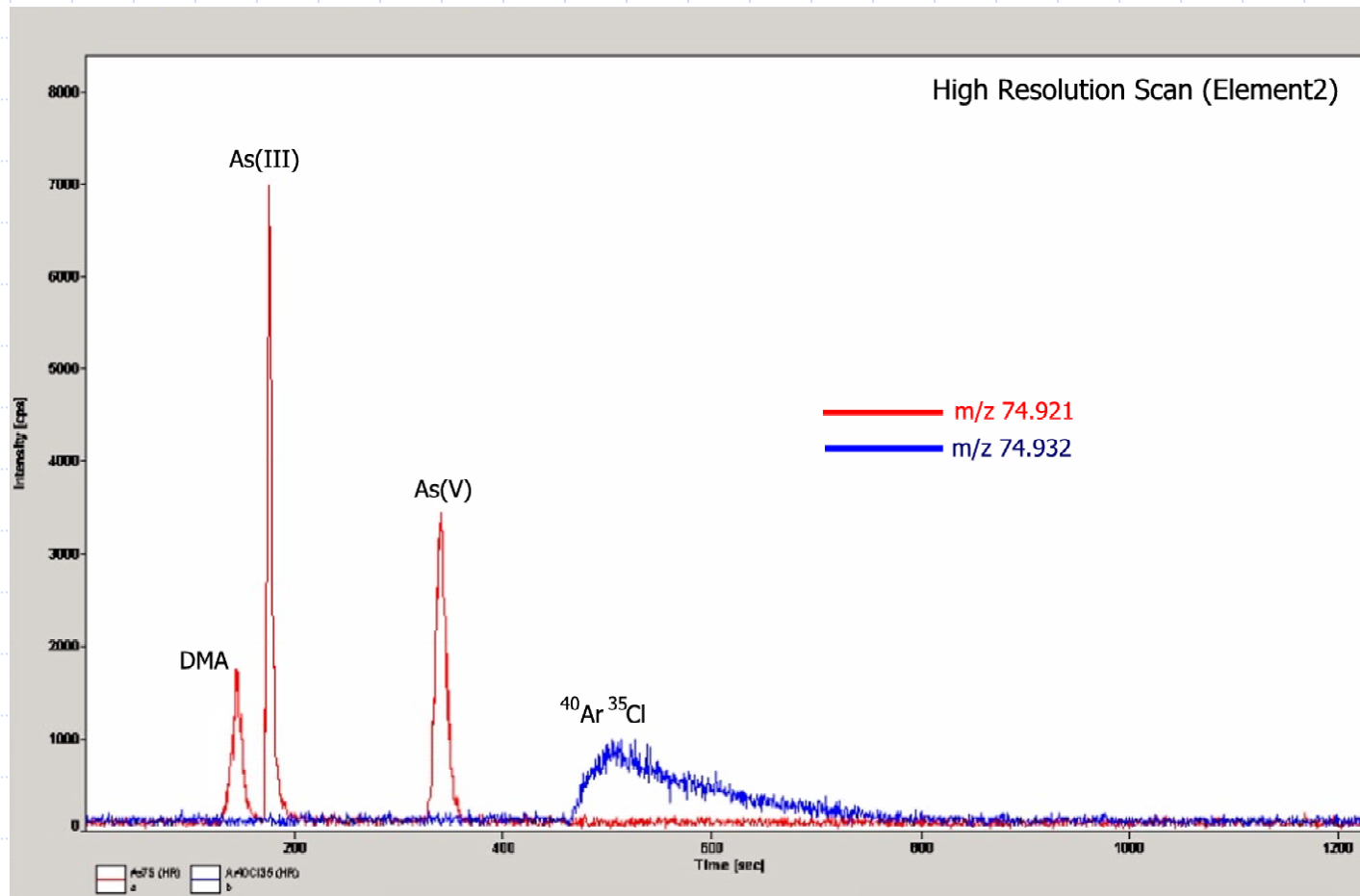
- 0, 2, 4, 8 & 16ppb linear calibration
- 9 μ L Injection Volume

Calibration Studies - DMA

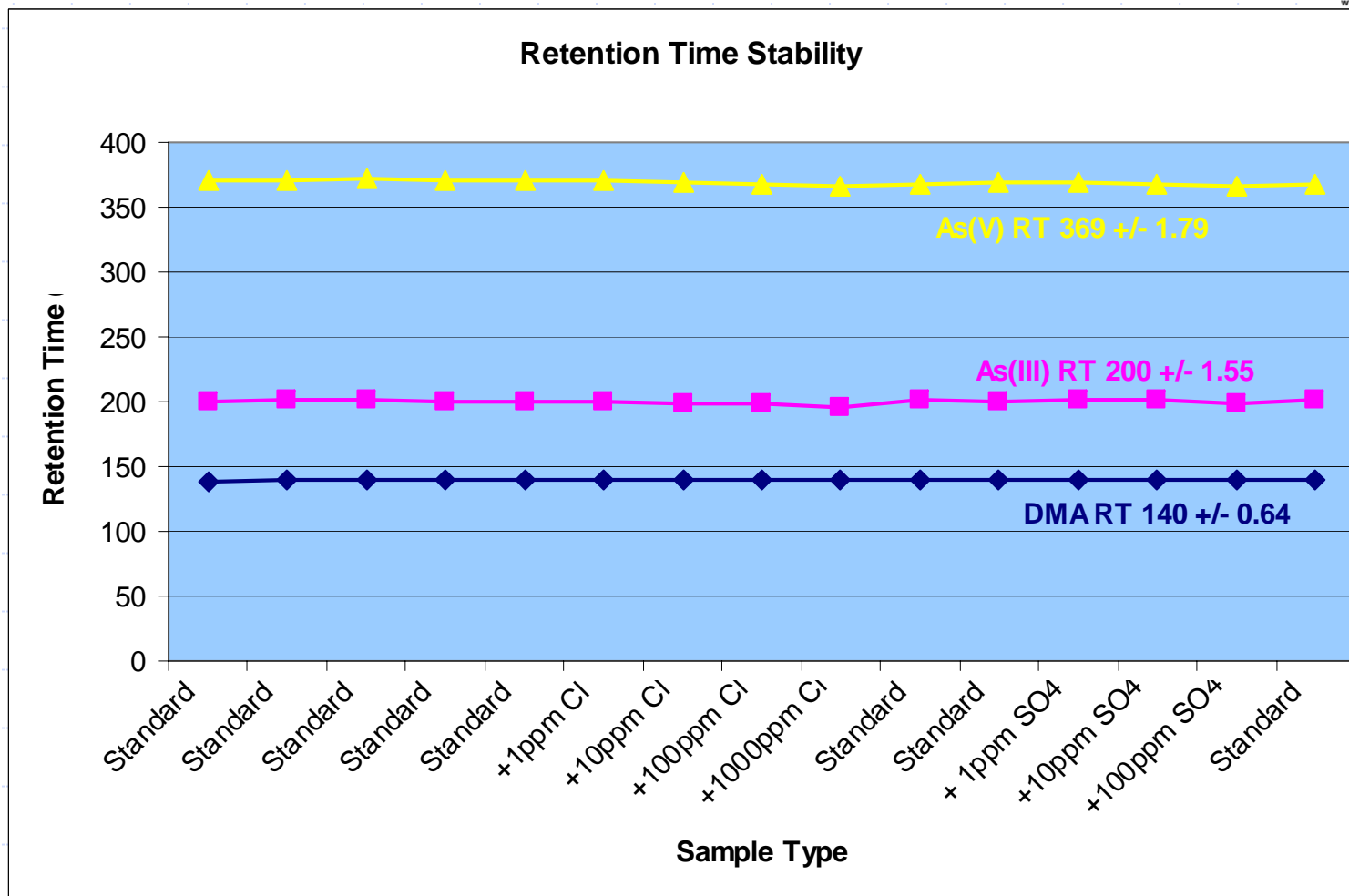


- 0, 2, 4, 8 & 16ppb linear calibration
- 9 μ L Injection Volume

ArCl Interference Removal



Retention Time Stability



Spike Recoveries

| | DMA | | As(III) | | As(V) | |
|--------------------------|-------------|----------|-------------|----------|-------------|----------|
| | Conc. (ppb) | Rec. (%) | Conc. (ppb) | Rec. (%) | Conc. (ppb) | Rec. (%) |
| Sample 1 | 0.56 | | 0.54 | | 20.68 | |
| Sample 1 + 5ppb Spike | 5.24 | 93.6 | 4.97 | 88.6 | 25.03 | 87.1 |
| Sample 2 | 0.37 | | 0.60 | | 20.63 | |
| Sample 2 + 5ppb Spike | 4.91 | 90.7 | 4.80 | 84.0 | 24.95 | 86.4 |
| Sample 3 | 0.41 | | 13.34 | | 24.69 | |
| Sample 3 + 5ppb Spike | 5.61 | 104.0 | 17.84 | 90.0 | 29.53 | 96.9 |

Summary

- SC-FAST performs fully automated robust separation of elemental species.
- Simple to use
- Low pressure, low cost separation