

Teledyne API 640x Field Comparison with the Thermo 1405DF, 1405F and R&P 2025 FRM

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St. Louis, MO

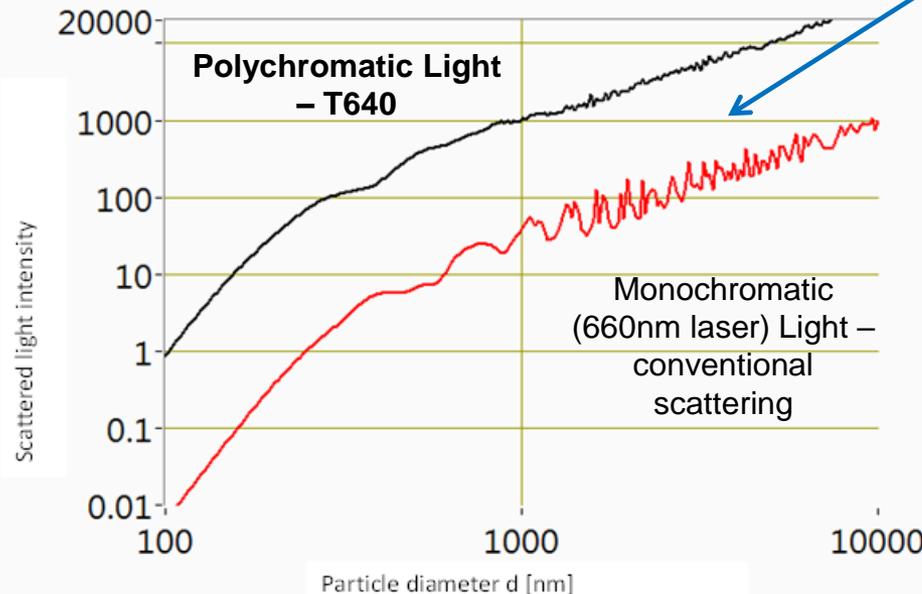




Theory of Operation

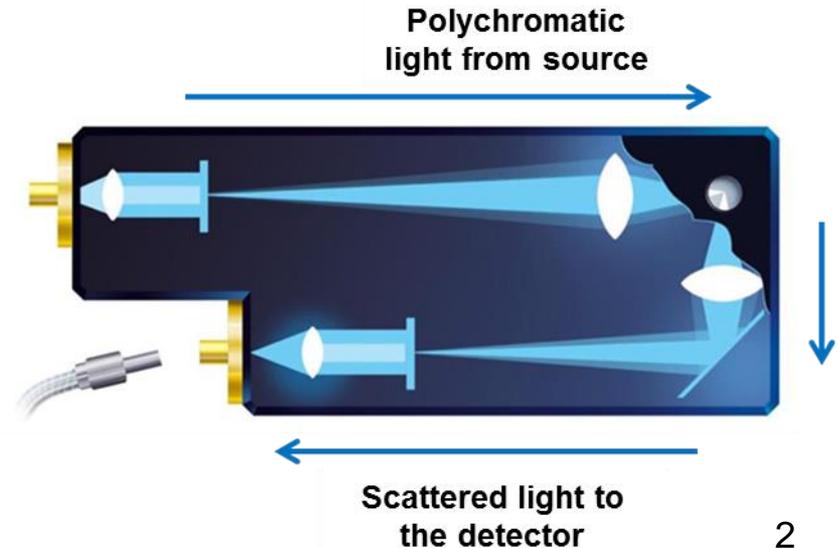
- Achieves a linear (non ambiguous) signal
- Provides both high resolution and wide particle size range
- PM Mass is calculated using a sophisticated mass conversion algorithm based upon years of proven ambient comparability assessments with Reference sampler data
- Only made possible with fundamentally accurate and high resolution particle size measurements

Scattering vs Particle Size



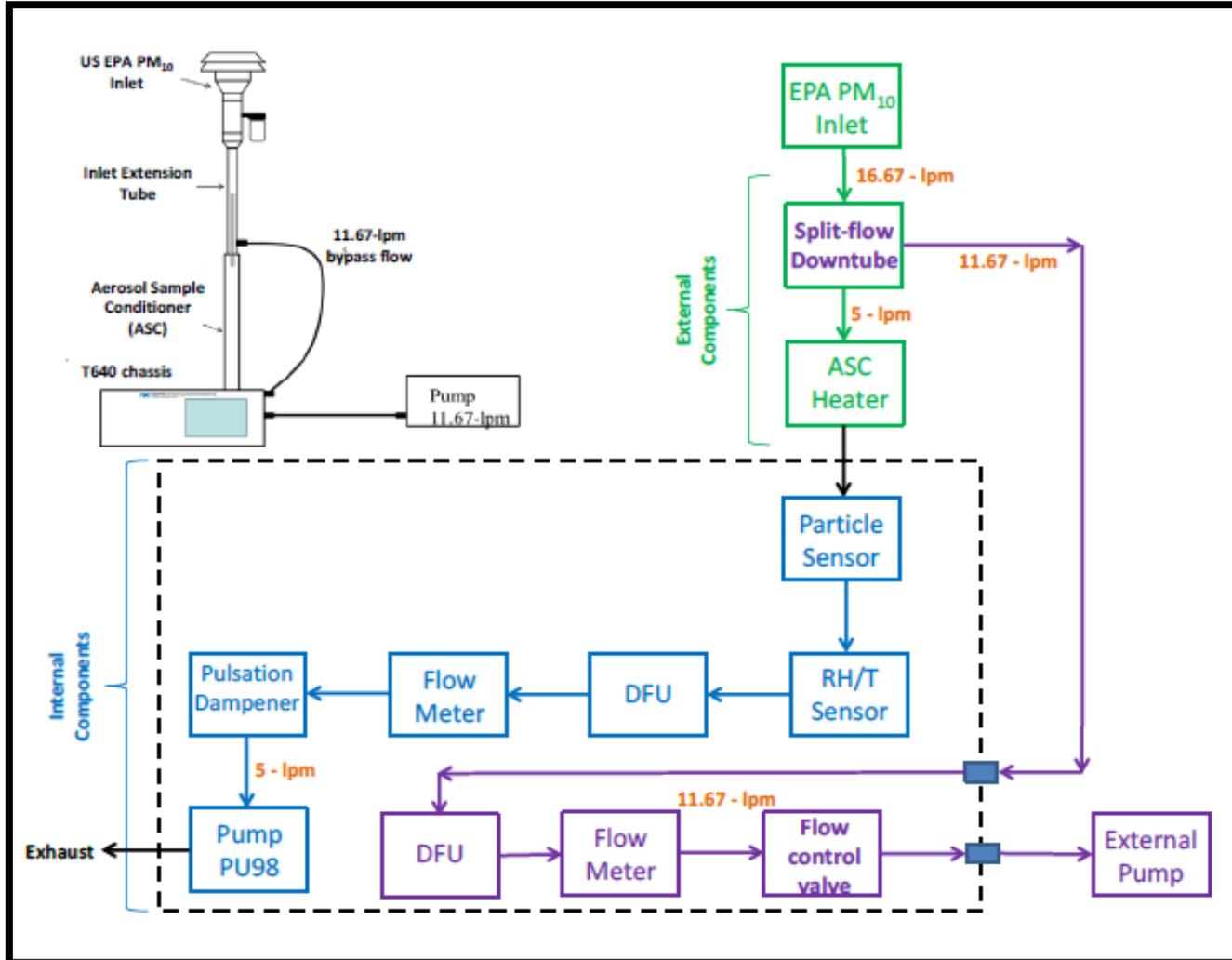
Based on Lorenz-Mie theory of scattered light analysis

Uncertainty





640x Flow Path





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API 640X



Maintenance schedule for 640x

Biweekly

Flow checks, pressure, temperature (cannot calibrate temperature because the engineers say they are never wrong)

Monthly

Leak check (or as needed)
Spandust check (or as needed)

6 months

Chamber cleaning-we do it every 5 or 6 spandust checks (or as needed)

Annually

Change DFU filter and the bypass flow inline filter (or when pump PWM approaches 80%)

640x Installation dates

Blair St. (St. Louis)

Blair Primary December 19, 2017

Blair Collocated February 21, 2018

Troost (Kansas City)

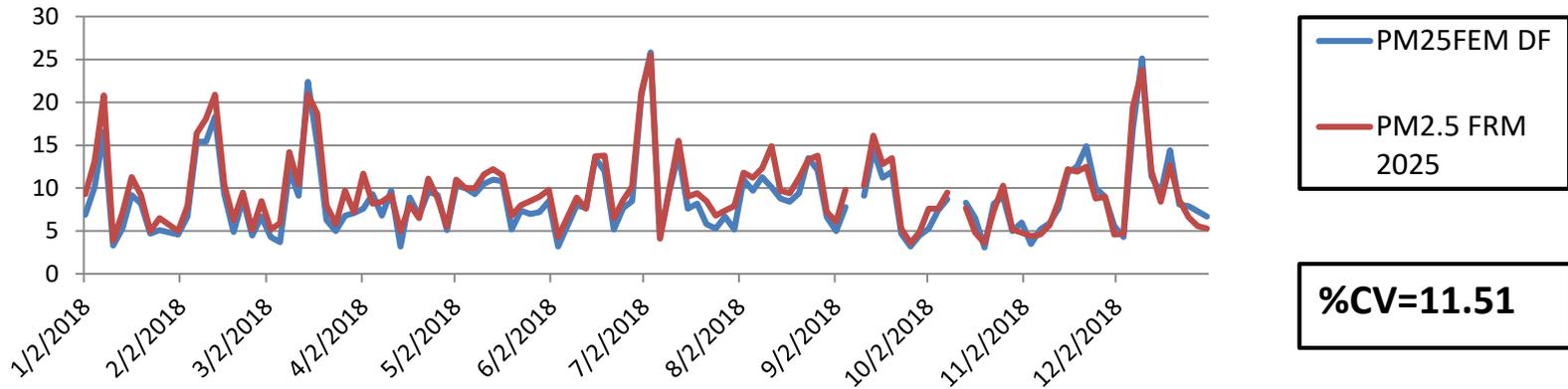
Data collection started on February 26, 2019

Problems/Issues with 640x

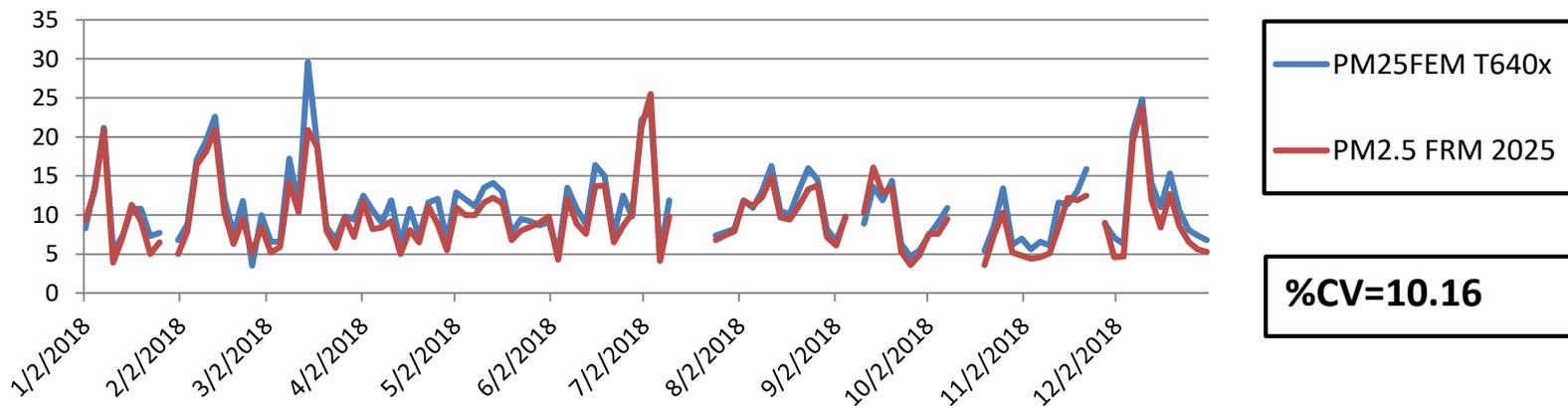
- Flow decrease due to clogged inline filters
- Clean the optics chamber due to Spandust contamination approximately every 6 Spandust checks-this has been more lately
- Streamline Pro decreases flow of instrument during checks so use Alicat, BGI or Streamline flow devices
- If the instruments start drifting apart, clean the optics chamber
- No pump problems yet
- Instrument locked up but was fixed with a firmware update



Blair St. PM2.5 DF vs. 2025FRM Daily Averages

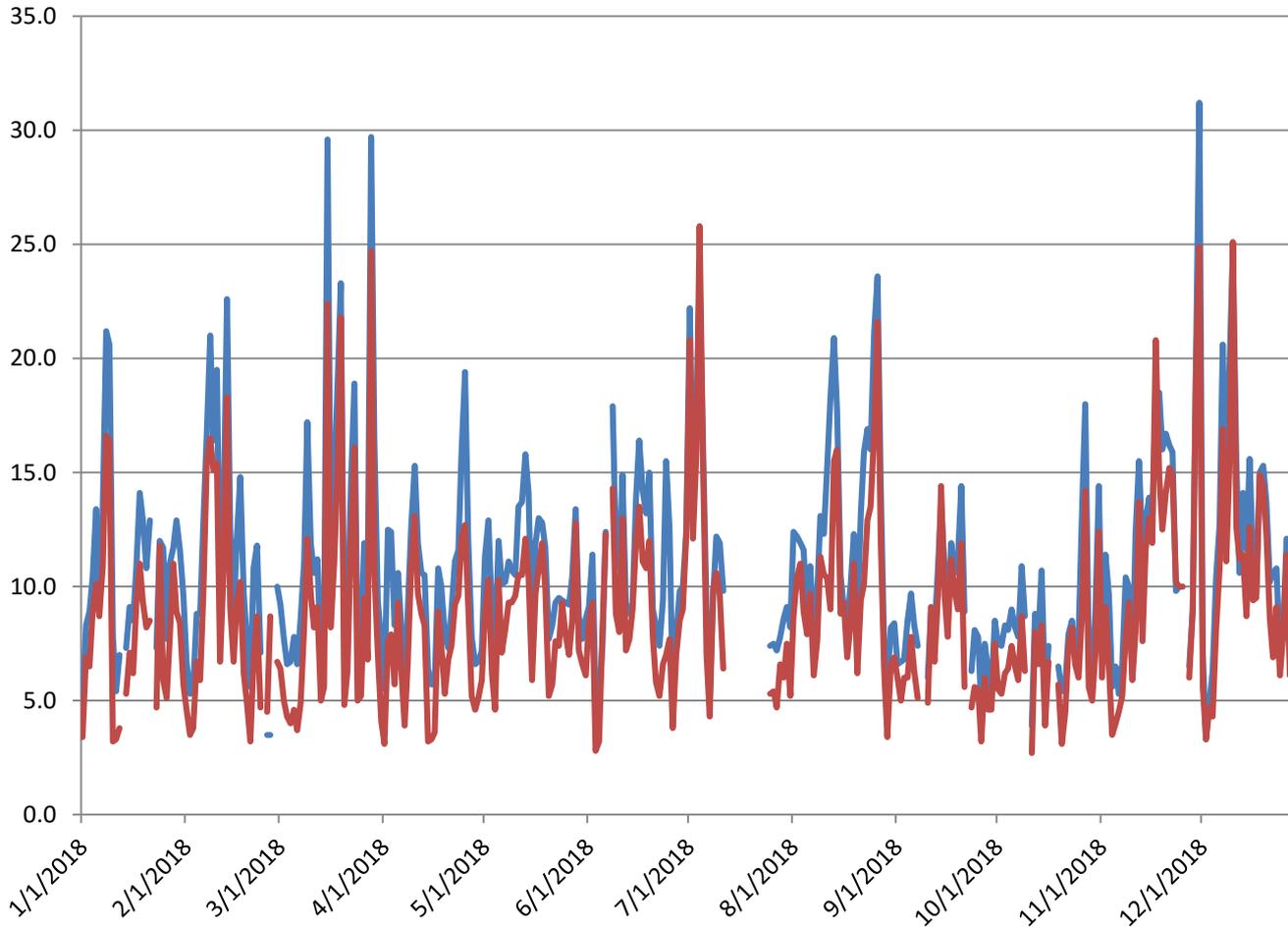


Blair St. 640x vs. 2025FRM Daily Averages





Blair St. 640x vs. DF PM2.5FEM Daily Averages

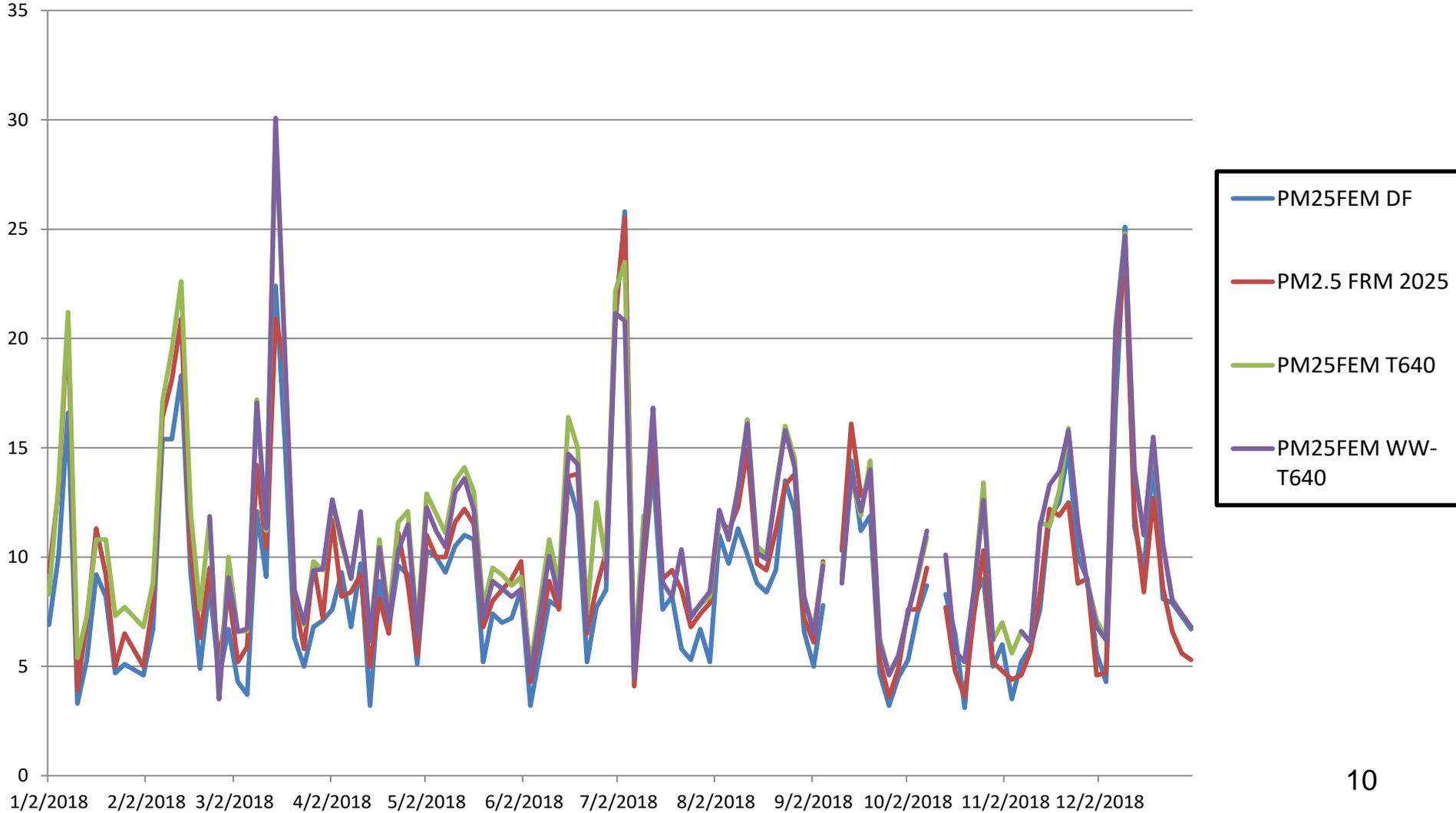


— 640pm25
— PM25FEMDF

%CV=3.69
640x vs. DF

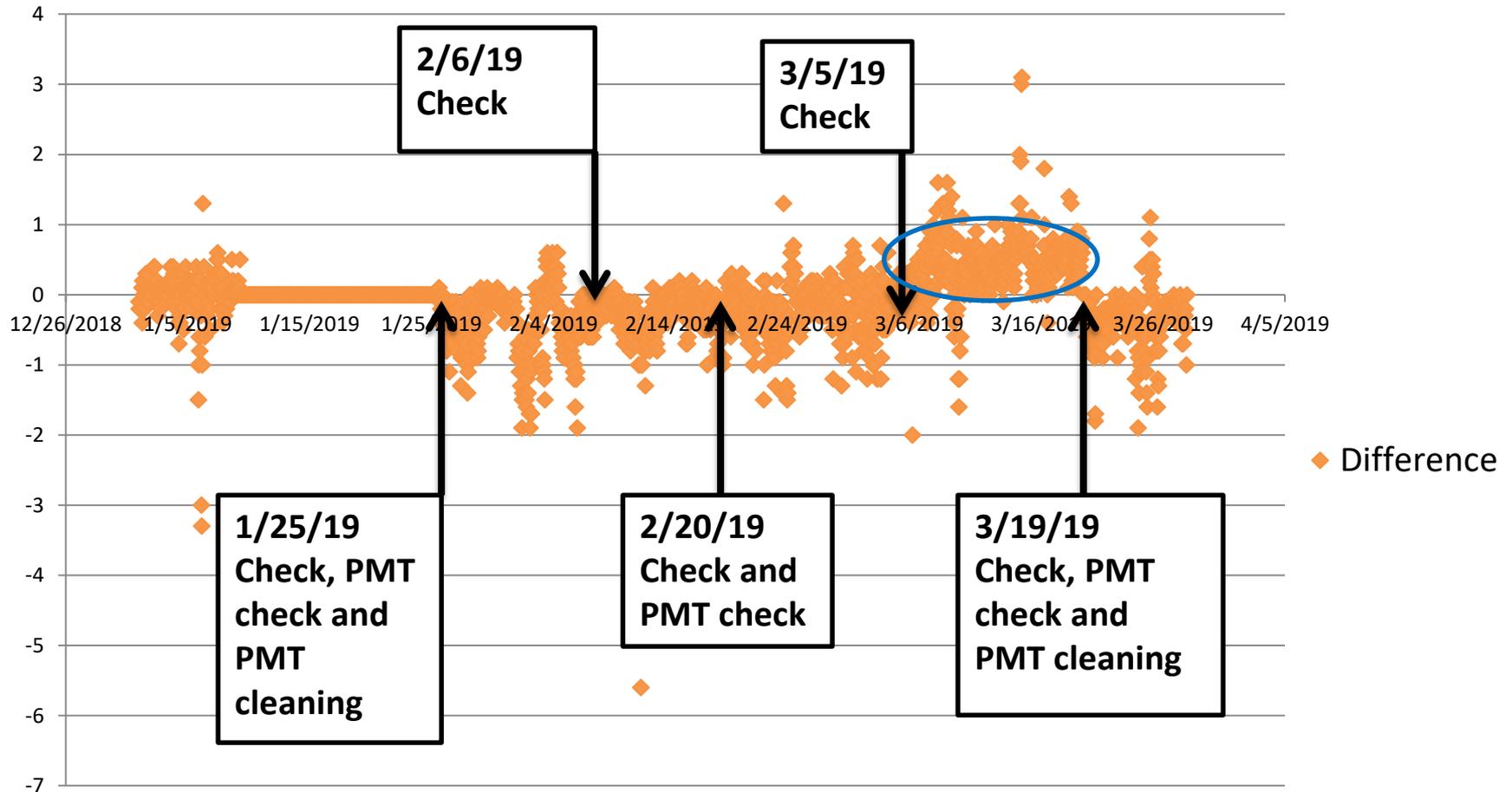


Blair St. PM2.5 DF, FRM, 640x Pri., and 640x Coll.





Blair St. T640x minus WWT640x, 1-hour Average Concentrations





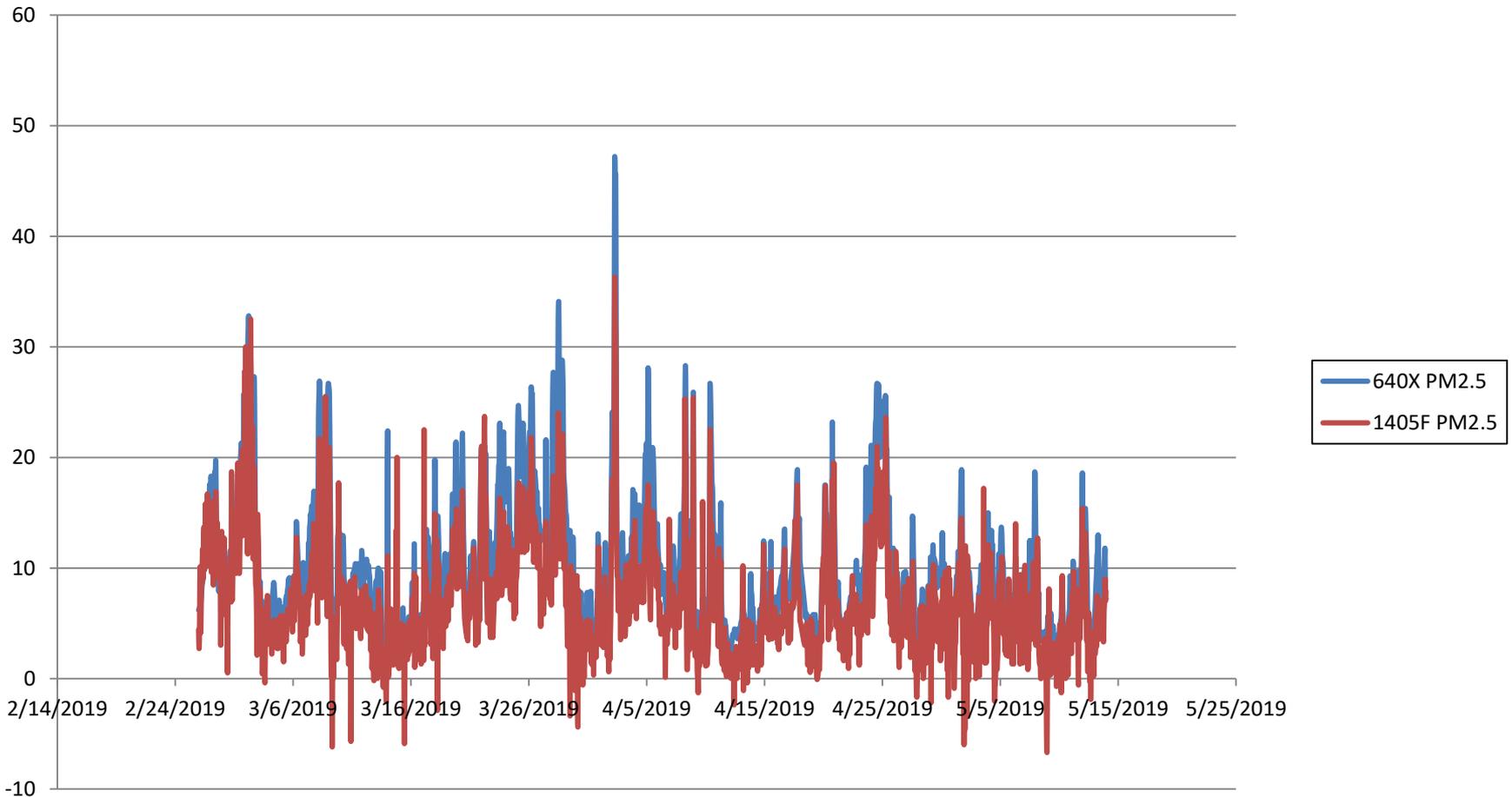
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Troost



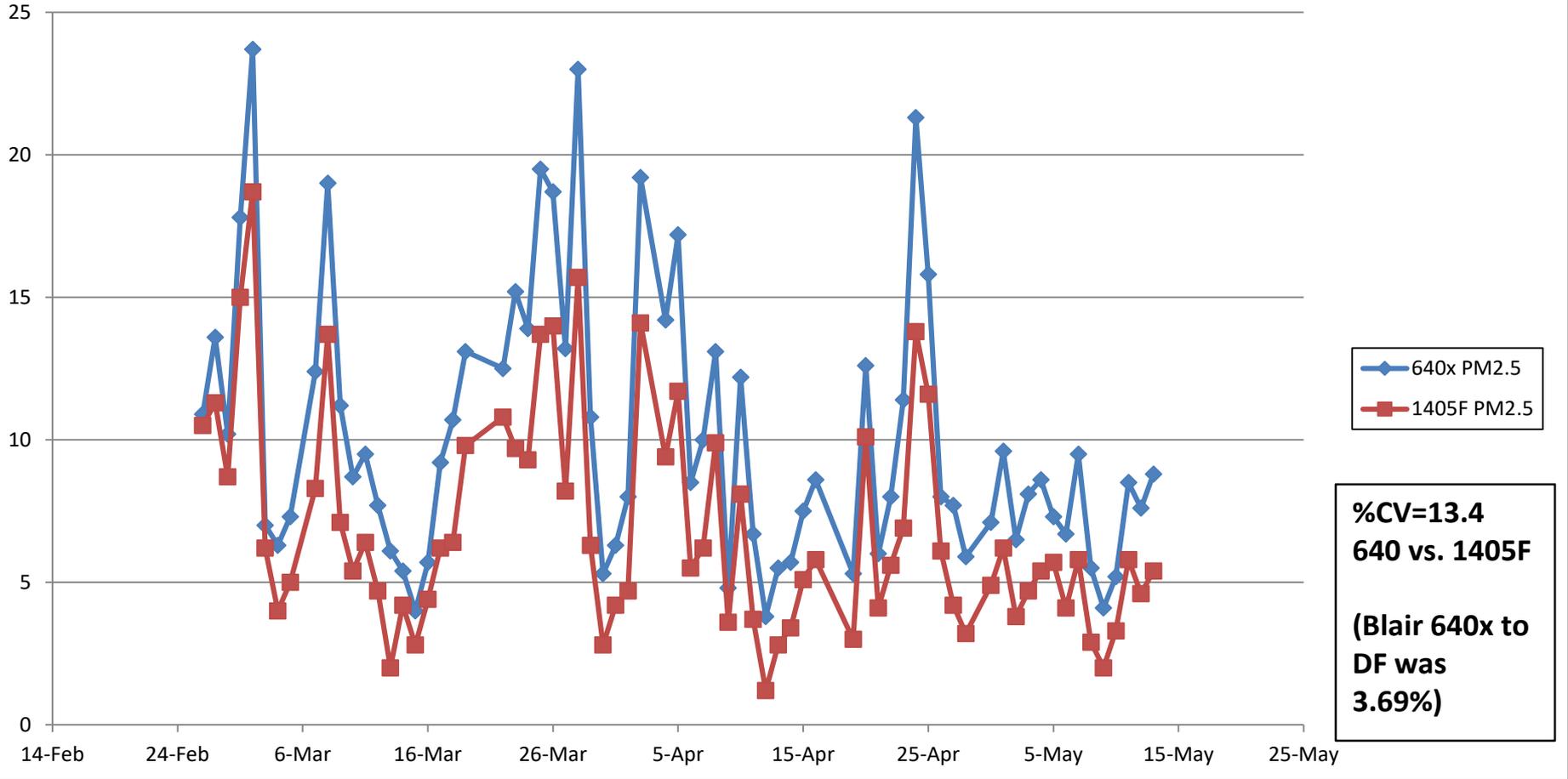


Troost 640x vs. 1405F 1hr. PM2.5 Feb. 26, 2019 to May 13, 2019



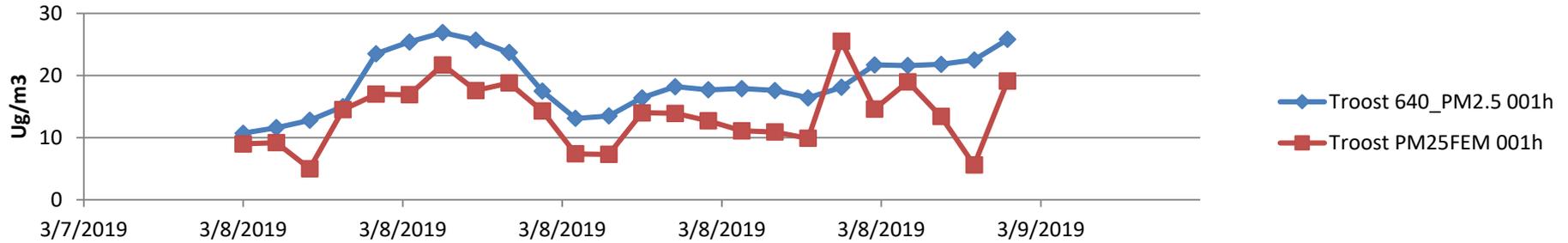


Troost 640x vs. 1405F PM2.5 24hr. data Feb. 26, 2019 to May 13, 2019

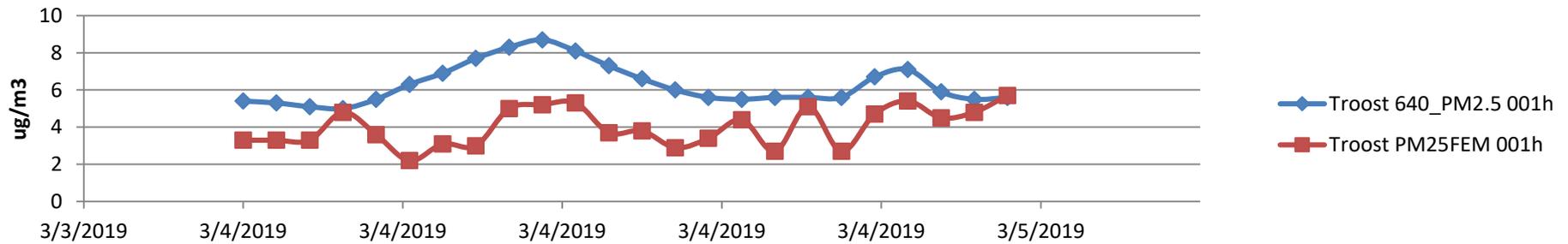




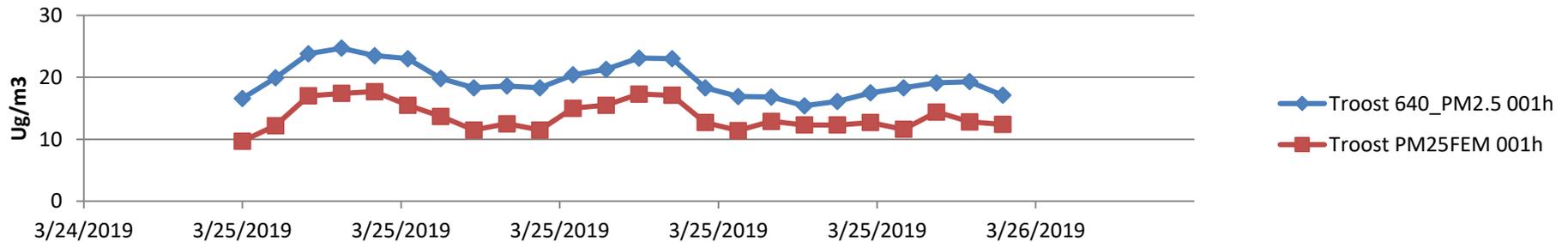
Troost 1 hr. data 640x vs. 1405F 3/8/19 (higher values)



Troost 1 hr. data 640x vs. 1405F 3/4/19 (lower values)



Troost 1 hr. data 640x vs. 1405F 3/25/19



References:

- 1) Teledyne Advanced Pollution Instrumentation Model T640 PM Mass Monitor Instruction Manual. 2018