

Field Evaluation Met One E-Sampler



Background

- From 7/14/2017 to 9/15/2017, two **Met One E-Samplers** were deployed in Rubidoux and were run side-by-side SCAQMD Federal Reference Method (FRM) instruments measuring the same pollutants
- Met One E-Sampler (2 units tested):
 - Particle sensor (**optical; non-FEM**)
 - Each unit measures PM_{2.5} (µg/m³), ambient air temperature (degree C), relative humidity (%), wind speed (m/s), and wind direction
 - **Unit cost: ~\$5,500**
 - Time resolution: 5-min
 - Units IDs:
 - W12
 - P22
- Met One BAM (reference method):
 - Beta-attenuation monitors (**FEM PM_{2.5}**)
 - Measures PM_{2.5} (µg/m³)
 - **Unit cost: ~\$20,000**
 - Time-resolution: 1-hr

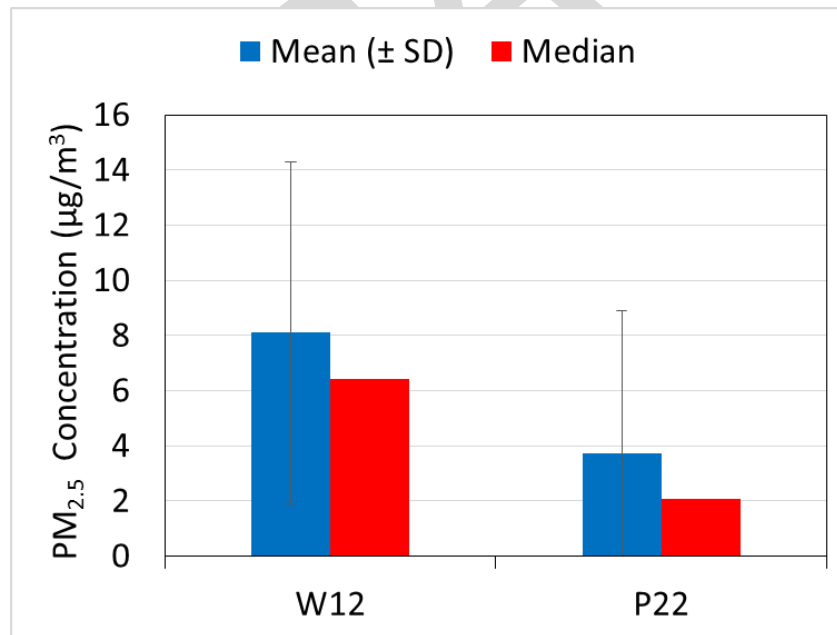


Data validation & recovery

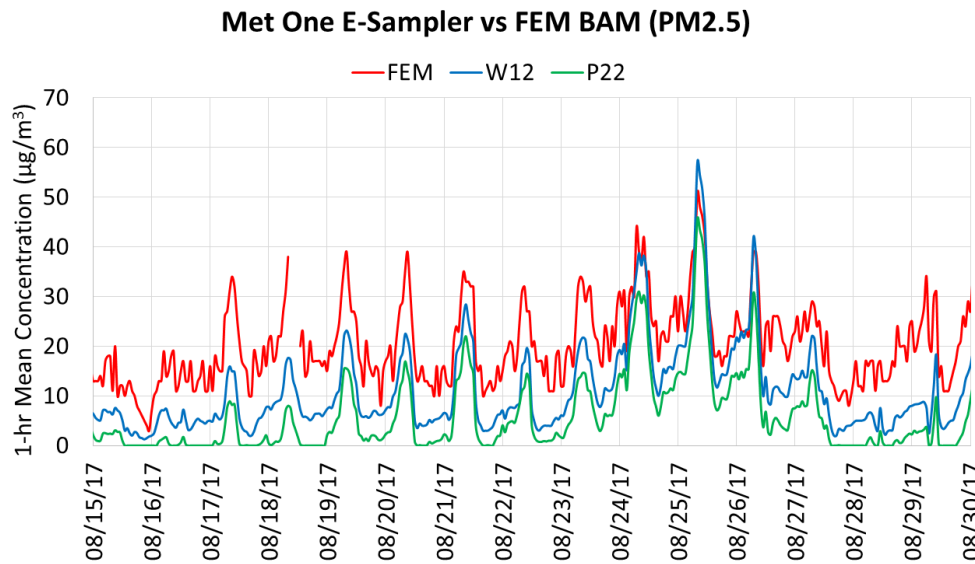
- Basic QA/QC procedures were used to validate the collected data (i.e. obvious outliers, negative values, and invalid data-points were eliminated from the data-set)
- Data recovery was near 100% for both units tested

Met One E-sampler; intra-model variability

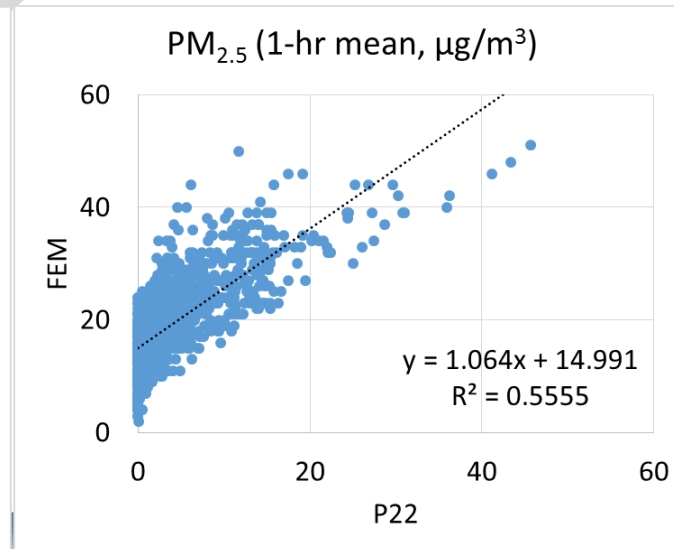
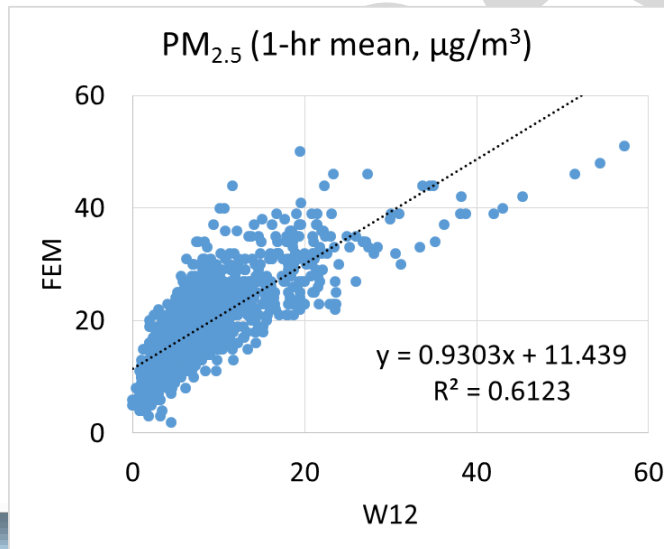
- Relatively high measurement variation was observed between the two E-Samplers tested



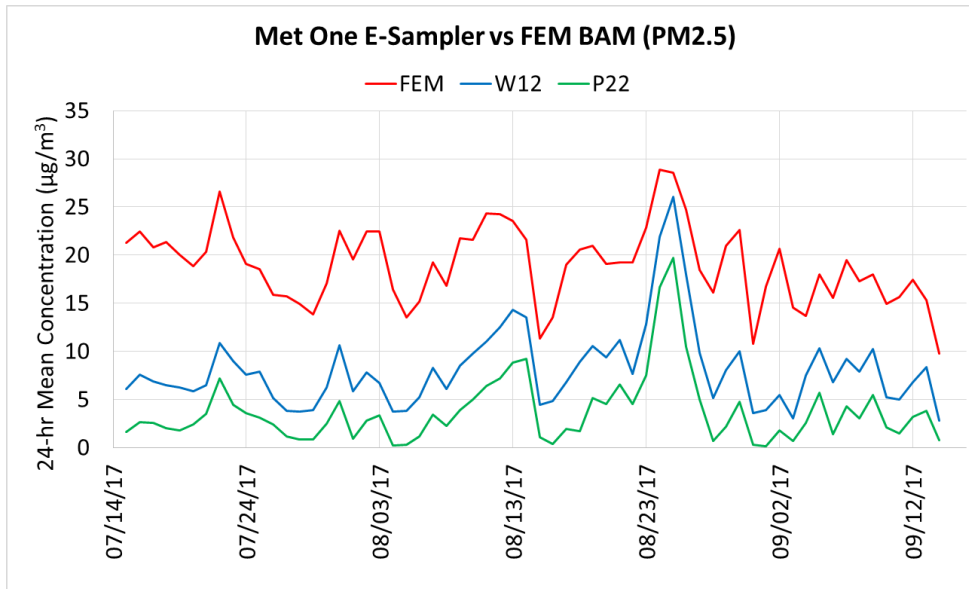
Met One E-Sampler vs FEM BAM (PM_{2.5} Mass; 1-hr mean)



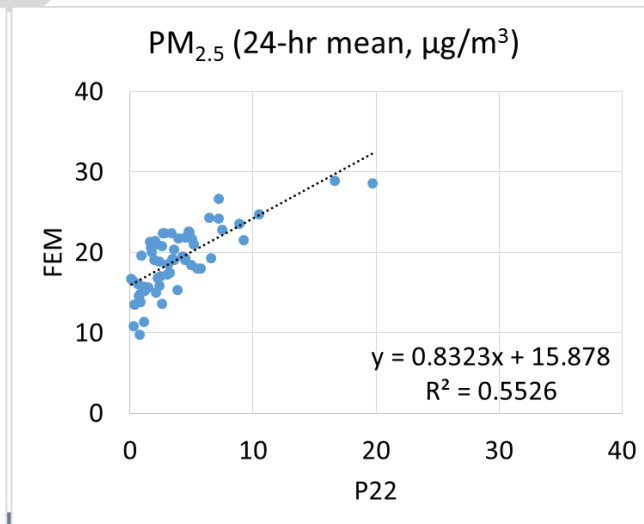
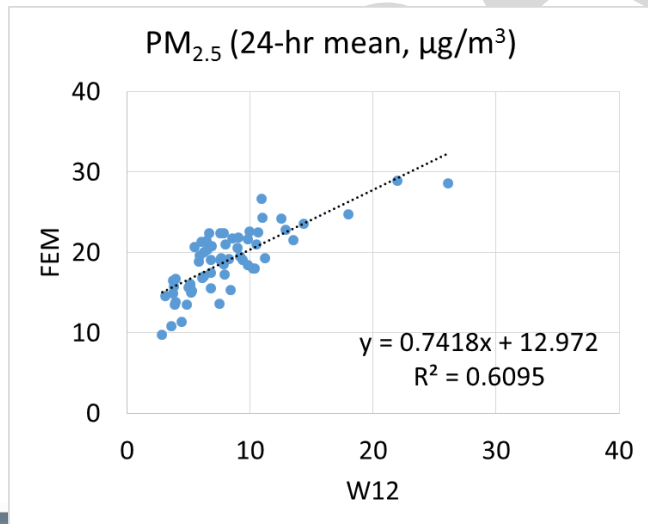
- Met One E-Sampler PM_{2.5} mass measurements show moderate correlations with the corresponding FEM BAM data ($0.55 < R^2 < 0.62$).
- The two sensor units tested seem to track well the diurnal PM_{2.5} variations recorded by the FEM BAM instrument.
- Met One E-Samplers seem to underestimate the FEM measurement data.



Met One E-Sampler vs FEM BAM (PM_{2.5} Mass; 24-hr mean)



- Met One E-Sampler PM_{2.5} mass measurements correlate moderately with the corresponding FEM BAM data ($0.55 < R^2 < 0.61$).
- The two sensor units tracked well the day-to-day PM_{2.5} variations recorded by the FEM BAM instrument.
- Met One E-Samplers seem to underestimate the FEM measurement data.



Discussion

- Overall, Met One E-Samplers were reliable with high data recovery (~100%)
- The two units tested showed relatively high intra-model variability for PM_{2.5} mass concentration
- The Met One E-Samplers demonstrated moderate correlations ($R^2 > 0.55$) with the FEM instrument, while underestimated the FEM (BAM) measurement data
- It should be noted that no sensor calibration had been performed by SCAQMD Staff prior to the beginning of this field testing
- Laboratory chamber testing may be necessary to fully evaluate the performance of these sensors over different / more extreme environmental conditions
- All results are still preliminary