

AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Evaluation Summary

Sensor Description

Manufacturer/Model:

Dylos/
DC1700-PM

Pollutants:
PM_{2.5} and PM₁₀ mass
concentration

Time Resolution:
1 minute

Type: Optical



- Overall, the Dylos DC1700-PM sensors showed low accuracy as compared to the reference instrument for PM_{2.5}, for a conc. range between 0 to 300 µg/m³. Accuracy improved as PM_{2.5} concentration increased
- The Dylos DC1700-PM sensors exhibited high precision for all T/RH combinations and all PM concentrations.
- The Dylos DC1700-PM sensors (IDs: Unit 1, Unit 2 and Unit 3) showed low intra-model variability.
- Data recovery was ~100% from all units in the field and in the laboratory.
- For PM_{2.5}, the Dylos DC1700-PM sensors showed moderate to strong correlations with the FEM GRIMM, FEM BAM and FEM T640 from the field (PM_{2.5} 0.52 < R² < 0.72) and showed no to very weak correlations with GRIMM, FEM BAM and T640 for PM₁₀ (R² < 0.21). The Dylos DC1700-PM sensors showed very strong correlations with the FEM GRIMM in the laboratory studies (R² > 0.95 for PM_{2.5}).
- The same three Dylos DC1700-PM units were tested both in the field (1st stage of testing) and in the laboratory (2nd stage of testing)

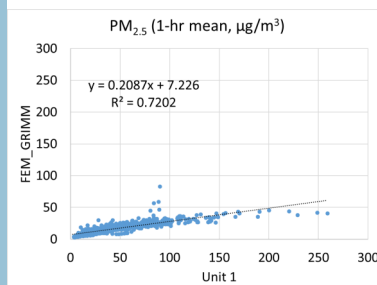
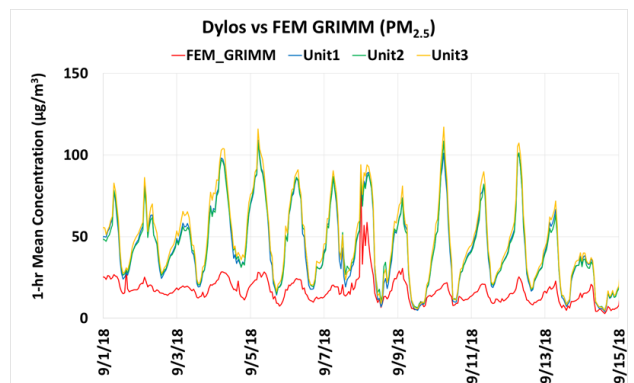
Field Evaluation Highlights

- Deployment period 08/22/2018 - 10/11/2018: the three Dylos DC1700-PM sensors showed moderate to strong correlations with PM_{2.5} mass concentration as monitored by FEM GRIMM, FEM BAM and FEM T640. PM₁₀ mass conc. showed no to very weak correlations with the corresponding GRIMM, FEM BAM and T640 data
- The units showed very low intra-model variability and data recovery of ~100%.

1-hr mean, all ref. instr.

PM_{2.5}: 0.52 < R² < 0.72

PM₁₀: 0.06 < R² < 0.21



Coefficient of Determination (R²) quantifies how the three sensors followed the PM_{2.5} concentration change by the reference instruments.

An R² approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Additional Information

Field evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/field>

Lab evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/laboratory>

AQ-SPEC website:

<http://www.aqmd.gov/aq-spec>

Laboratory Evaluation Highlights

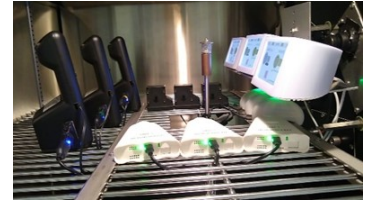
Accuracy (PM_{2.5})

$$A (\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$$

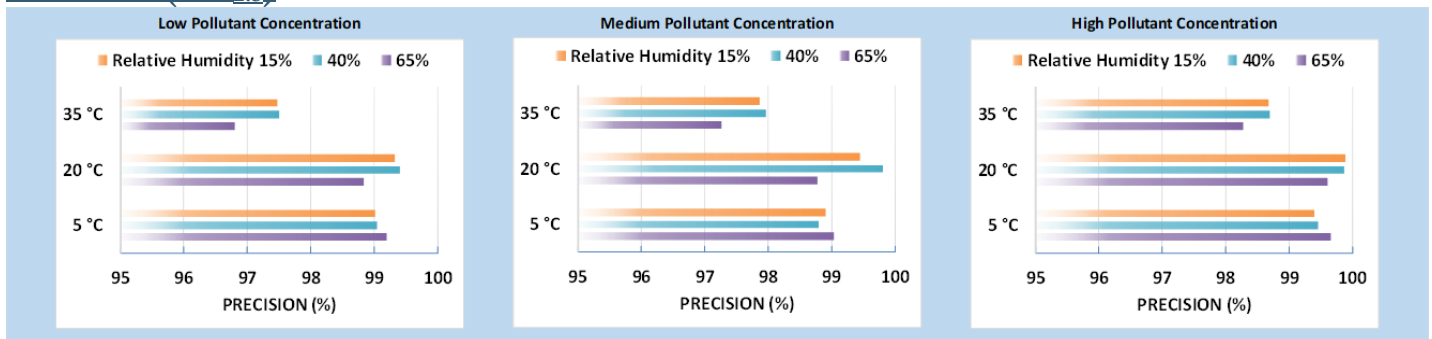
Steady state #	Sensor Mean (µg/m ³)	FEM GRIMM (µg/m ³)	Accuracy (%)
1	62.4	10.2	-413.0
2	90.0	15.2	-392.4
3	277.8	59.6	-266.0
4	496.1	153.1	-124.0
5	658.1	270.1	-43.7

Accuracy was evaluated by a concentration ramping experiment at 20 °C and 40%. The sensor's readings at each ramping steady state are compared to the reference instrument.

A negative % means sensors' overestimation by more than two fold. The higher the positive value (close to 100%), the higher the sensor's accuracy.

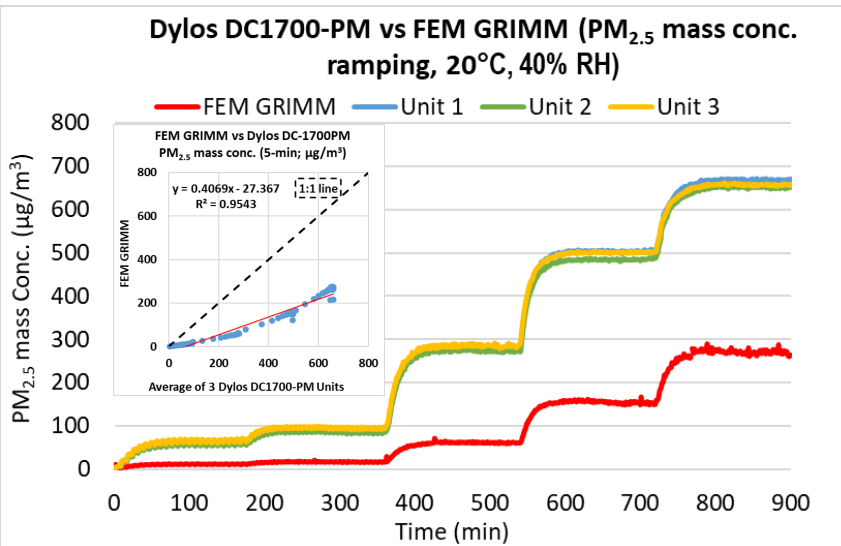


Precision (PM_{2.5})



Sensor's ability to generate precise measurements of PM_{2.5} concentration at low, medium, and high pollutant levels were evaluated under 9 combinations of T and RH, including extreme weather conditions like cold and dry (5 °C and 15%) cold and humid (5 °C and 65%), hot and humid (35 °C and 65%), or hot and dry (35 °C and 15%).

Coefficient of Determination



The Dylos DC1700-PM sensors showed very strong correlations with the corresponding FEM PM_{2.5} data ($R^2 > 0.95$) at 20 °C and 40% RH.

Climate Susceptibility

From the laboratory studies, temperature and relative humidity had effect on the Dylos DC1700-PM sensor performance at 65% RH.

Observed Interferents

N/A



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