AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Sensor Description

Manufacturer/Model: Dylos/DC1100 PRO & DC1700

Pollutants: PM Count

Measurement Range: 0 - 200000 #/L

Type: Optical

Additional Information

Field evaluation report:
http://www.aqmd.gov/aq-spec/evaluations/field

Lab evaluation report:
http://www.aqmd.gov/aq-spec/evaluations/laboratory

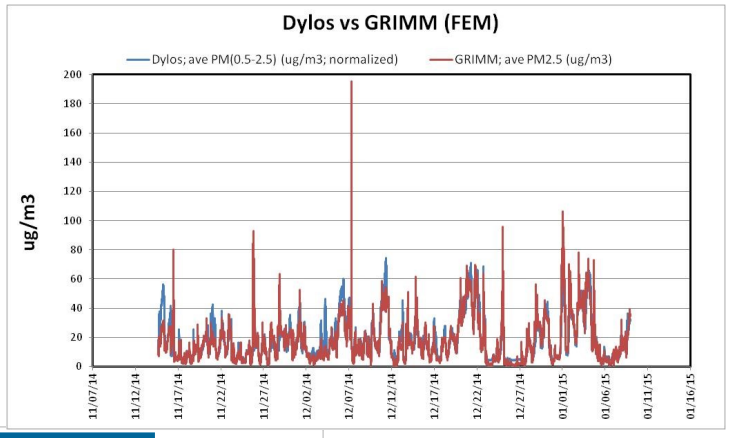
AQ-SPEC website:
http://www.aqmd.gov/aq-spec

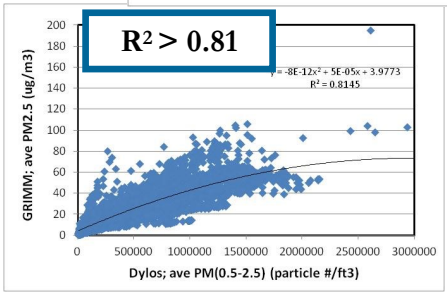
Evaluation Summary

- Dylos DC1100 PRO model was used in the field evaluation. DC1700 model was used in the laboratory evaluation. The main difference between the two models is the power supply: DC1100 PRO is powered by battery, whereas DC1700 runs both on battery and power cable.
- In the laboratory study, three DC1700 units showed accuracy increased from -325% to 78% with increasing particle number concentration as compared to GRIMM over the range of 0 – 200000 #/L.
- The three Dylos DC1700 sensors exhibited high precision for most tested environmental conditions, except at 5 °C and 65%.
- Both DC1700 and DC1100 PRO showed low intra-model variability as well as good data recovery.
- Dylos sensors showed strong correlation with the reference instrument from both field (DC1100 PRO; $R^2 > 0.81$) and laboratory studies (DC1700; $R^2 > 0.89$).

Field Evaluation Highlights

- Deployment period 11/14/2014- 01/09/2014: the three **Dylos DC1100 PRO** PM sensors showed strong correlations with the $PM_{2.5}$ concentration change as monitored by FEM instrument. (Polynomial regression equation used to "convert" DC1100 PRO's particle count measurements to PM mass concentrations. See DC1100 PRO Field Evaluation.)
- The units showed good data recovery as well as low intra-model variability.





Coefficient of determination (R^2) quantifies how the three sensors followed the PM concentration change by GRIMM.

An R^2 approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Laboratory Evaluation Highlights

Accuracy

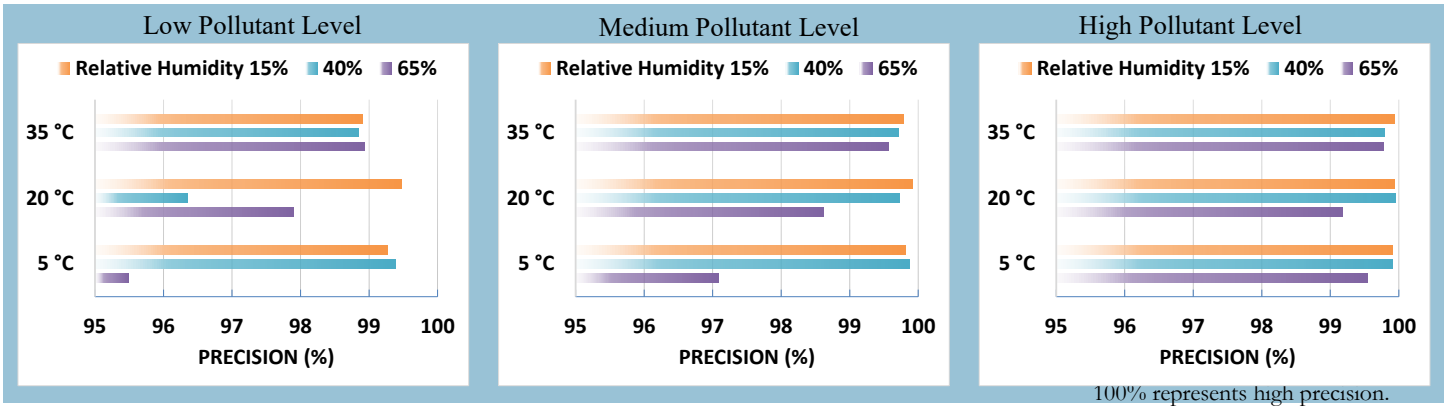
$$A\,(\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$$

Steady State (#)	Sensor mean (#/L)	GRIMM (#/L)	Accuracy (%)
1	22223	4235	-325
2	52460	14314	-166
3	76464	26176	-92
4	165596	136104	78

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

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

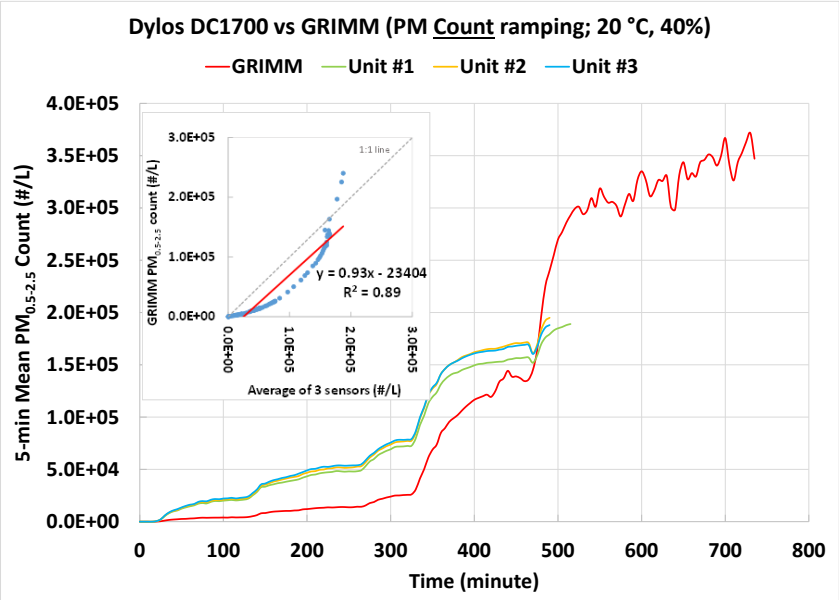
Precision



100% represents high precision.

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

Coefficient of Determination



The three Dylos DC1700 sensors showed strong correlations with the corresponding GRIMM $PM_{0.5\text{-}2.5}$ count data (R^2 = 0.89) at 20 °C and 40% RH.

Climate Susceptibility

In most cases, temperature and relative humidity did not affect DC1700 units' precision. At 5 °C and 65% RH, Dylos DC1700 units reported spiked changes in $PM_{0.5\text{-}2.5}$ count concentrations, resulting into the lowest precision observed.

Observed Interferents

Not tested for PM sensors