

AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Sensor Description

Manufacturer/Model:

IQAir/

AirVisual Pro v1.1683

Pollutants:

PM_{2.5} mass concentration

Measurement Size Range:

0.3 - 2.5 μm

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

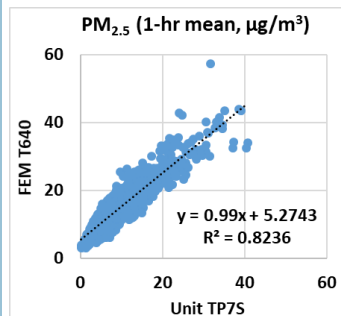
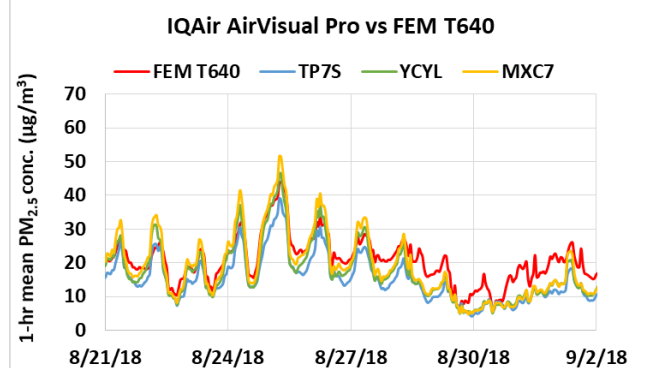
- Overall, the IQAir AirVisual Pro sensors showed good accuracy as compared to the reference instrument for PM_{2.5}, except at ~ 300 μg/m³.
- The IQAir AirVisual Pro sensors exhibited high precision for all T/RH combinations and all PM concentrations.
- The IQAir AirVisual Pro sensors (IDs: TP7S, YCYL, MXC7) showed low intra-model variability.
- Data recovery was ~100% from all units in the field and in the laboratory, except for Unit YCYL which did not report data in several laboratory experiments.
- For PM_{2.5}, the IQAir AirVisual Pro sensors showed moderate to strong correlations with the FEM GRIMM, FEM BAM and FEM T640 from the field (PM_{2.5} 0.66 < R² < 0.82). The IQAir AirVisual Pro sensors showed very strong correlations with the FEM GRIMM in the laboratory studies (R² = 0.99 for PM_{2.5}).
- The same three IQAir AirVisual Pro units were tested both in the field (1st stage of testing) and in the laboratory (2nd stage of testing)

Field Evaluation Highlights

- Deployment period 08/15/2018 - 10/11/2018: the three IQAir AirVisual Pro sensors showed moderate to strong correlations with PM_{2.5} mass concentration as monitored by FEM GRIMM, FEM BAM and FEM T640.
- The units showed very low intra-model variability and data recovery of ~100%.

1-hr mean, all ref. instr.

PM_{2.5}: 0.66 < R² < 0.82



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.

Laboratory Evaluation Highlights

Accuracy (PM_{2.5})

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

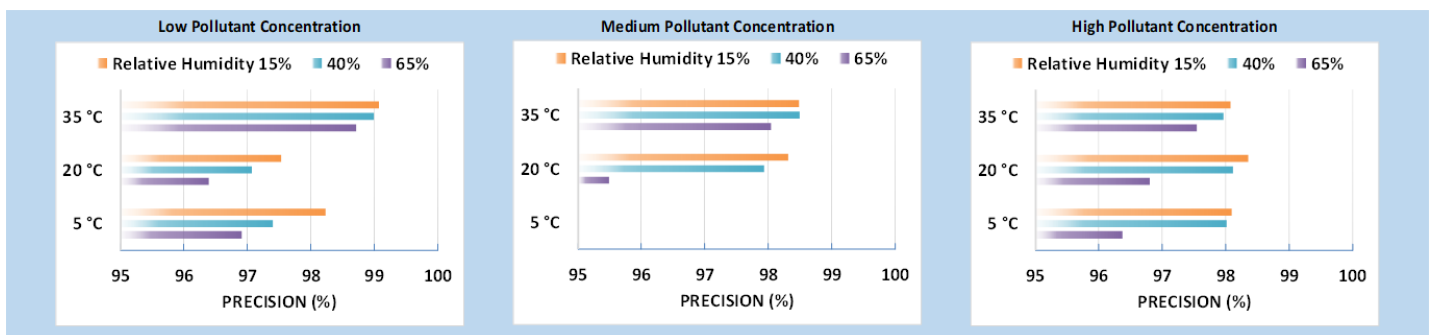
Steady state #	Sensor Mean (µg/m ³)	FEM GRIMM (µg/m ³)	Accuracy (%)
1	11.2	10.18	89.7
2	17.5	15.20	84.9
3	64.6	59.62	91.7
4	172.4	153.11	87.4
5	338.2	270.07	74.8

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.



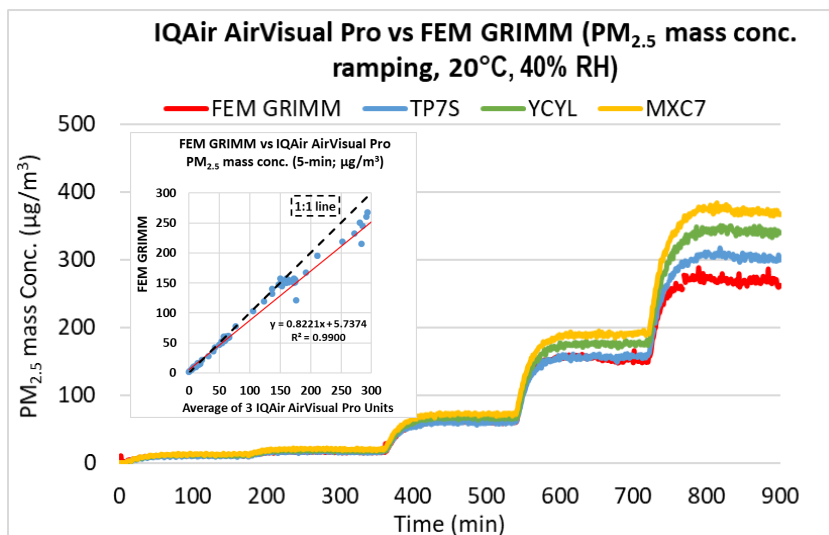
Precision (PM_{2.5})



100% represents high precision.

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 IQAir AirVisual Pro sensors showed very strong correlations with the corresponding FEM PM_{2.5} data ($R^2 = 0.99$) at 20 °C and 40% RH.

Climate Susceptibility

From the laboratory studies, temperature and relative humidity had effect on the IQAir AirVisual Pro sensor performance at 65% RH.

Observed Interferents

N/A



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