

AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Evaluation Summary

Sensor Description

Manufacturer/Model:

Elitech
Temtop P20

Pollutants:

PM_{2.5} mass concentration

Time Resolution:

5 min.

Type: Optical



- Overall, the Temtop P20 sensors showed moderate to high accuracy (68% to 87%) over the PM_{2.5} mass concentration range tested. The Temtop P20 sensors underestimated PM_{2.5} measurements from FEM T640x in the laboratory experiments at 20 °C and 40% RH.
- The Temtop P20 sensors showed high precision for all test combinations (PM concentrations, T and RH) for PM_{2.5} mass concentrations
- The Temtop P20 sensors showed low intra-model variability in the field evaluation (IDs: 1, 2, and 3) and moderate intra-model variability in the laboratory evaluation (IDs: 2 and 3).
- Data recovery for all units was ~ 90-100% in the field evaluation and 100% in the laboratory evaluation.
- For PM_{2.5}, Temtop P20 sensors showed weak to strong correlations with the FEM T640 from the field ($0.41 < R^2 < 0.88$). The Temtop P20 sensors showed very strong correlations with the FEM T640x in the laboratory evaluations ($R^2 > 0.99$ for PM_{2.5}).
- The same three Temtop P20 units were tested both in the field (1st stage of testing) and in the laboratory (2nd stage of testing), but only Unit IDs 2 and 3 operated properly and were able to log data during the laboratory evaluation.

Field Evaluation Highlights

- Deployment period 08/26/2020 to 10/21/2020: the three Temtop P20 sensors showed weak to strong correlations with the corresponding T640 PM_{2.5} mass concentrations.
- The units exhibited low intra-model variability and data recovery for PM_{2.5} was ~90-100% from all units.

5-min mean, T640

PM_{2.5}: $0.41 < R^2 < 0.88$

Additional Information

Field evaluation report:

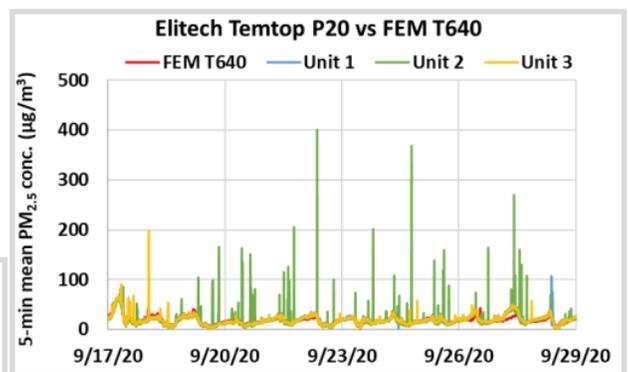
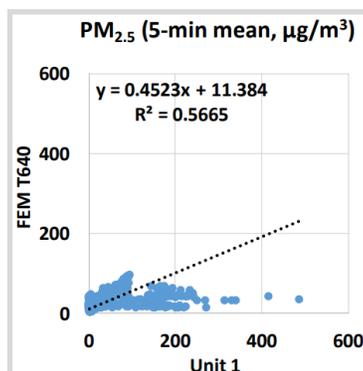
<http://www.aqmd.gov/aq-spec/evaluations/field>

Lab evaluation report:

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

AQ-SPEC website:

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



Coefficient of Determination (R^2) quantifies how the three sensors followed the PM_{2.5} concentration change by the reference instruments.

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 (PM_{2.5})

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

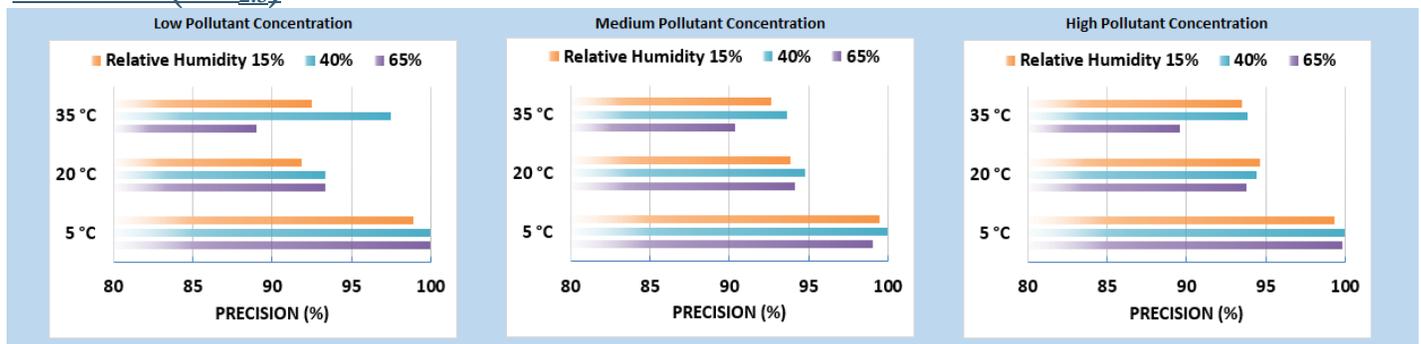
Steady State #	Sensor Mean (µg/m ³)	FEM T640x (µg/m ³)	Accuracy (%)
1	6.1	9.0	67.7
2	39.8	47.8	83.2
3	85.6	98.2	87.2
4	168.4	196.0	85.9
5	257.0	295.9	86.8

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.



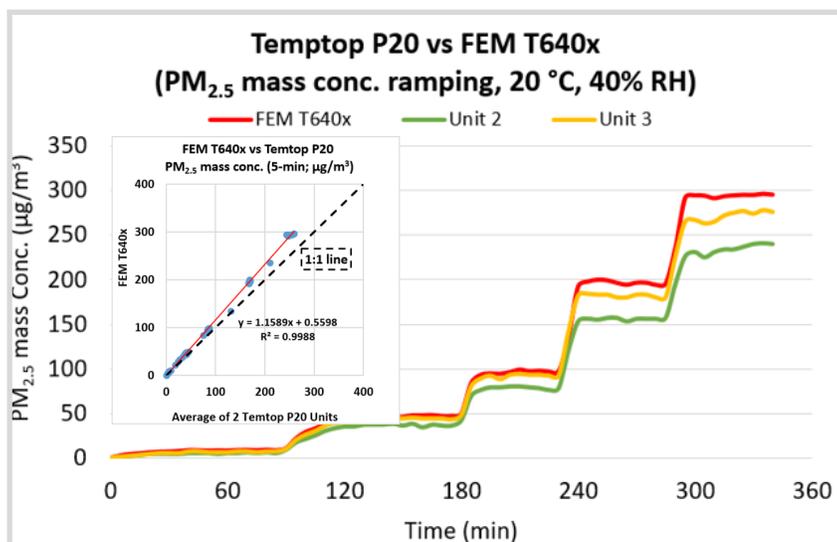
Precision (PM_{2.5})



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 Temtop P20 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, the Temtop P20 sensors' precision decreased with increasing temperature, while relative humidity had minimal effect; the sensors showed spiked conc. changes at the 65% RH change points for all temperature and PM conc. levels.

Observed Interferents

N/A



All documents, reports, data, and other information provided in this document are for informational use only. Mention of trade names or commercial products does not constitute endorsement or recommendation. As a Government Agency, the South Coast AQMD and its AQ-SPEC program highly recommend interested entities to make use and purchase decisions based on the requirements of their study design, the technical aspects and features of their specific project applications.