

# AQ-SPEC

## Air Quality Sensor Performance Evaluation Center

### Evaluation Summary

#### Sensor Description

Manufacturer/Model:  
Elitech/  
Temtop LKC-1000S+

Pollutants:  
PM<sub>2.5</sub> and PM<sub>10</sub> mass  
concentration

Time Resolution:  
1 min.

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>

- Overall, the accuracy of the Temtop LKC-1000S+ sensors was fairly constant (57% to 69%) over the PM<sub>2.5</sub> mass concentration range tested. The Temtop LKC-1000S+ sensors overestimated PM<sub>2.5</sub> measurements from FEM GRIMM in the laboratory experiments at 20 °C and 40% RH.
- The Temtop LKC-1000S+ sensors showed high precision for all test combinations (PM concentrations, T and RH) for PM<sub>2.5</sub> mass concentrations
- The Temtop LKC-1000S+ sensors (IDs: 1, 2, and 3) showed low intra-model variability in both the field and laboratory evaluations.
- Data recovery was ~ 93% and 100% from all units in the field and laboratory evaluations, respectively.
- For PM<sub>2.5</sub>, Temtop LKC-1000S+ sensors showed very strong correlations with the FEM GRIMM from the field ( $R^2 > 0.90$ ) and weak correlations with GRIMM for PM<sub>10</sub> ( $0.31 < R^2 < 0.35$ ). The Temtop LKC-1000S+ sensors showed very strong correlations with the FEM GRIMM in the laboratory evaluations ( $R^2 > 0.99$  for PM<sub>2.5</sub>).
- The same three Temtop LKC-1000S+ units were tested both in the field (1<sup>st</sup> stage of testing) and in the laboratory (2<sup>nd</sup> stage of testing)

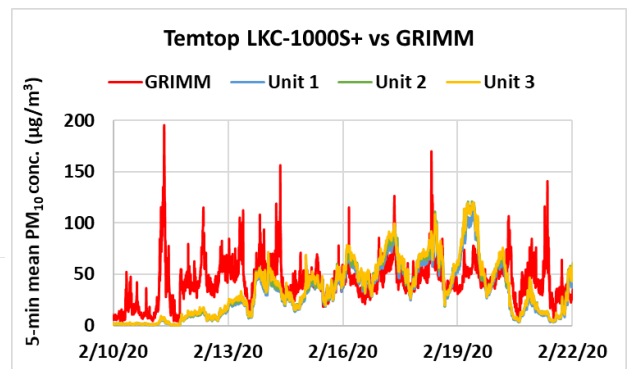
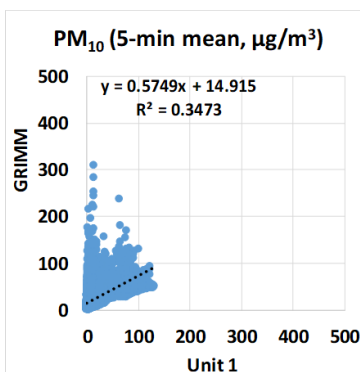
### Field Evaluation Highlights

- Deployment period 01/27/2020 to 03/27/2020: the three Temtop LKC-1000S+ sensors showed very strong and weak correlations with the corresponding GRIMM PM<sub>2.5</sub> and PM<sub>10</sub> mass concentrations, respectively.
- The units exhibited low intra-model variability and data recovery for PM<sub>2.5</sub> was ~93% from all units.

5-min mean, GRIMM

PM<sub>2.5</sub>:  $R^2 > 0.90$

PM<sub>10</sub>:  $0.31 < R^2 < 0.35$



Coefficient of Determination ( $R^2$ ) quantifies how the three sensors followed the PM<sub>2.5</sub> 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<sub>2.5</sub>)

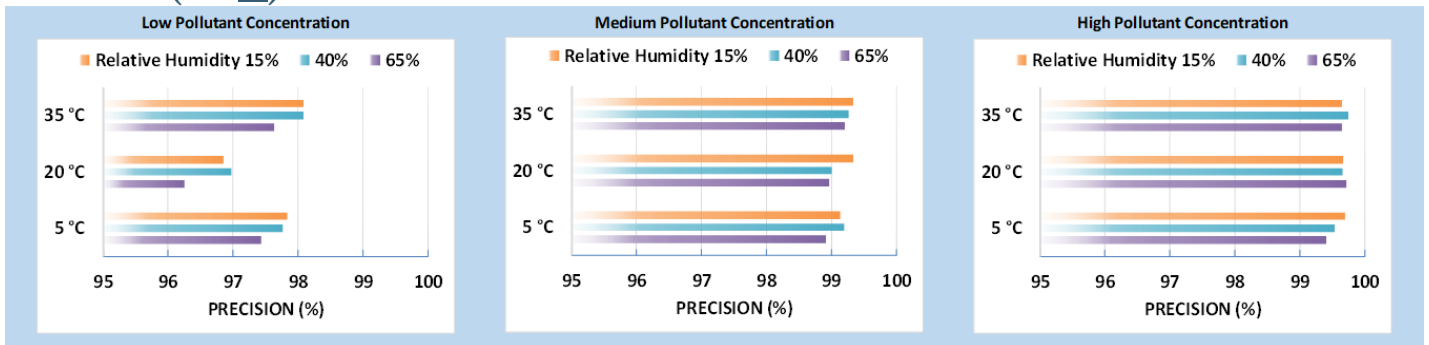
Steady state #	Sensor Mean (µg/m <sup>3</sup> )	FEM GRIMM (µg/m <sup>3</sup> )	Accuracy (%)
1	11.0	8.4	68.9
2	19.2	13.7	60.1
3	61.9	45.3	63.3
4	160.1	117.7	64.1
5	375.1	261.5	56.6

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.



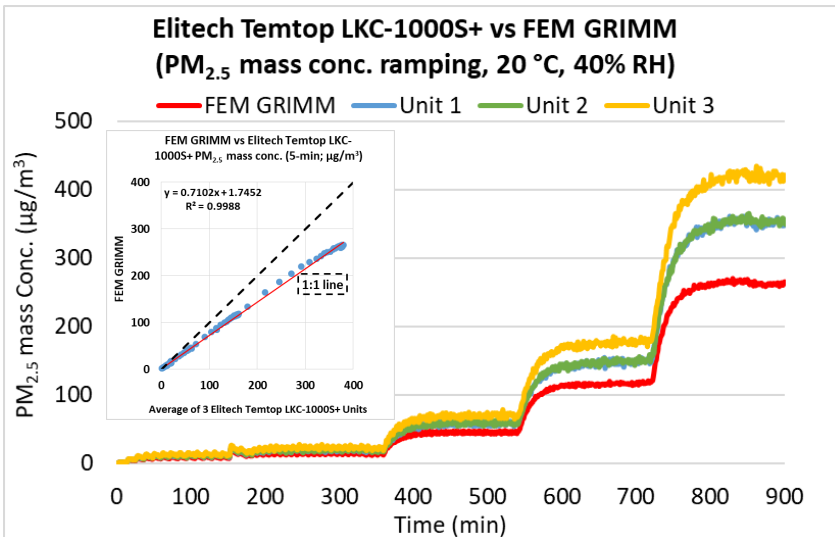
## Precision (PM<sub>2.5</sub>)



100% represents high precision.

Sensor's ability to generate precise measurements of PM<sub>2.5</sub> 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 LKC-1000S+ sensors showed very strong correlations with the corresponding FEM PM<sub>2.5</sub> data ( $R^2 > 0.99$ ) at 20 °C and 40% RH.

## Climate Susceptibility

From the laboratory studies, temperature and relative humidity had minimal effect on the Temtop LKC-1000S+ sensors' precision; the sensors showed small spiked conc. changes at the 65% RH change points at 5 °C for high PM level.

## Observed Interferents

N/A



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