**Evaluation Summary**

- Overall, the three Aeroqual AQY sensors showed low to moderate accuracy. They overestimated the FEM GRIMM PM$_{2.5}$ measurements for a concentration range between 0 to 400 µg/m$^3$.
- The three Aeroqual AQY sensors exhibited high precision for all T/RH combinations tested in the environmental chamber.
- Aeroqual AQY sensors (units IDs: 130, 131, 132) showed low intra-model variability in the field deployment as well as in the laboratory testing.
- Aeroqual AQY sensors had good data recovery (>99% for 5-min average in the field, and 100% for 1-min average in the laboratory).
- For PM$_{2.5}$, the Aeroqual AQY sensors showed good correlation with the reference instrument from both the field ($R^2 > 0.84$) and laboratory studies ($R^2 > 0.99$).

**Field Evaluation Highlights**

- Deployment period 12/22/2017 - 03/27/2018: the Aeroqual AQY sensors (units IDs: 130, 131, 132, 134) showed good correlations with PM$_{2.5}$ concentration change as monitored by FEM GRIMM and FEM BAM.
- The units showed > 99% data recovery as well as low intra-model variability.

**Coefficient of Determination ($R^2$)**

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

**Field evaluation report:**
http://www.aqmd.gov/aqspec/evaluations/field

**Lab evaluation report:**
http://www.aqmd.gov/aqspec/evaluations/laboratory

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

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**Sensor Description**

Manufacturer/Model:
Aeroqual
Model AQY v0.5

Pollutants:
PM$_{2.5}$

Measurement Range:
0 - 1000 µg/m$^3$

Type: Optical

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**Additional Information**

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Laboratory Evaluation Highlights

Accuracy

\[ A(\%) = 100 - \frac{|X - R|}{R} \times 100 \]

<table>
<thead>
<tr>
<th>Steady State (#)</th>
<th>Sensor Mean (µg/m³)</th>
<th>FEM GRIMM (µg/m³)</th>
<th>Accuracy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28.2</td>
<td>17.0</td>
<td>34.6</td>
</tr>
<tr>
<td>2</td>
<td>50.1</td>
<td>34.7</td>
<td>55.6</td>
</tr>
<tr>
<td>3</td>
<td>109.6</td>
<td>69.8</td>
<td>42.9</td>
</tr>
<tr>
<td>4</td>
<td>188.0</td>
<td>117.0</td>
<td>39.4</td>
</tr>
<tr>
<td>5</td>
<td>407.0</td>
<td>244.0</td>
<td>33.2</td>
</tr>
<tr>
<td>6</td>
<td>581.4</td>
<td>366.5</td>
<td>41.4</td>
</tr>
</tbody>
</table>

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 that sensors overestimate reference instrument’s reading by 2 folds.

Precision (PM\textsubscript{2.5})

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 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 three Aeroqual AQY sensors showed excellent correlation with the corresponding FEM PM\textsubscript{2.5} data (R\textsuperscript{2} > 0.99) at 20 °C and 40% RH.

Climate Susceptibility

From the laboratory studies, temperature and relative humidity had minimal effect on the Aeroqual AQY sensors’ precision. At the set-points of RH changes, Aeroqual AQY reported spiked changes in concentrations.

Observed Interferents

N/A

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