

# AQ-SPEC

## Air Quality Sensor Performance Evaluation Center

### Sensor Description

Manufacturer/Model:  
Aeroqual  
Model AQY v0.5

Pollutants:  
Ozone

Measurement Range:  
0 - 200 ppb

Type: Gas Sensitive  
Semiconductor (GSS)



### 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:

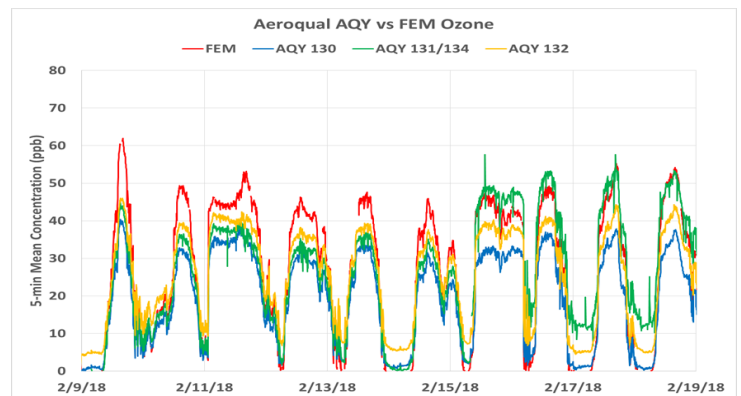
<http://www.aqmd.gov/aq-spec>

## Evaluation Summary

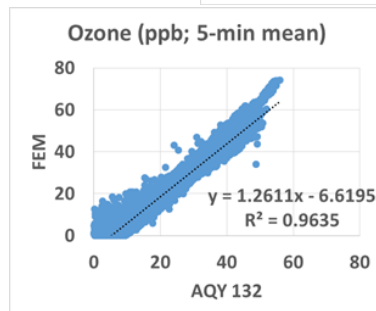
- Overall, the three Aeroqual AQY sensors (Units 130, 131 and 132) showed decreased accuracy with increasing ozone concentration in the laboratory studies; with accuracy ranging from 11.4% at the highest ozone concentration to 79% at the lowest ozone concentration. They underestimated the FEM ozone measurements for a concentration range between 0 to 400 ppb
- The three Aeroqual AQY sensors exhibited high precision for most of the tested T/RH combinations in the environmental chamber.
- The Aeroqual AQY sensors (Units 130 and 132) showed low intra-model variability in the field deployment and low to moderate intra-model variability in the laboratory testing (Units 130, 131 and 132).
- The Aeroqual AQY sensors had good data recovery (>92 % for 5-min average in the field (Units 130 and 132), and 100% for 1-min average in the laboratory (Units 130, 131 and 132)).
- For ozone, the Aeroqual AQY sensors (Units 130 and 132) showed very strong correlations with the reference instrument from both the field ( $R^2 \sim 0.96$ ) and laboratory studies ( $R^2 > 0.97$ ; Units 130, 131 and 132).

## Field Evaluation Highlights

- Deployment period 12/22/2017- 03/27/2018: the Aeroqual AQY sensors (units IDs: 130 and 132) showed very strong correlations with ozone concentration changes as monitored by the FEM instrument.
- The units showed > 92% data recovery as well as low intra-model variability.



$R^2 \sim 0.96$



Coefficient of Determination ( $R^2$ ) quantifies how the two sensors (Units 130 and 132) followed the ozone concentration change measured by the FEM instrument.

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

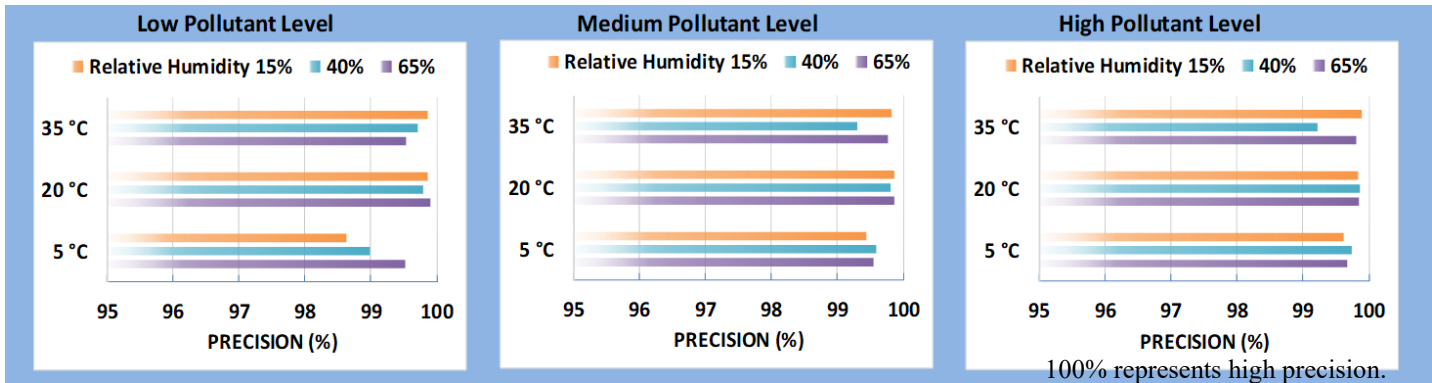
$$A (\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$$

Steady State (#)	Sensor mean (ppb)	FEM (ppb)	Accuracy (%)
1	15.4	19.5	79.0
2	17.9	42.9	41.7
3	20.8	68.8	30.2
4	30.0	178.8	16.8
5	42.0	368.3	11.4

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

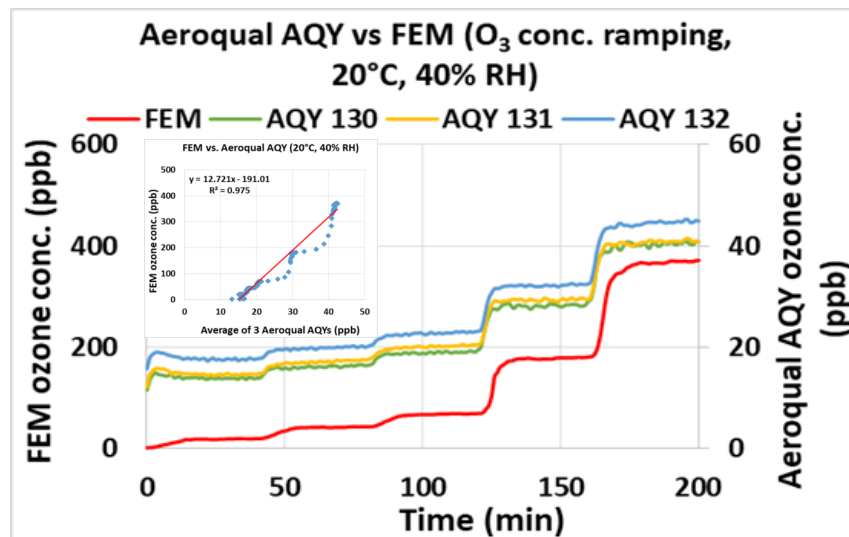


## Precision (Ozone)



Sensor's ability of generating precise measurements of ozone 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 very strong correlations with the corresponding FEM data ( $R^2 > 0.97$ ) at 20 °C and 40% RH.

## Climate Susceptibility ( $R^2$ )

$R^2$	5 °C	20 °C	35 °C
15%	0.966	0.966	0.967
40%	0.969	0.975	0.967
65%	0.970	0.961	0.961

## Observed Interferents

N/A



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