# AIR QUALITY MONITORING SYSTEM

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Interdisciplinary Renewable & Environmental Chemistry REU

OBJECTIVES

- Setup an air quality monitoring system.
- Determine if the inside or outside air quality is better.

BACKGROUND

- Air Quality is the monitoring of the air pollutants in the air. The sources of air pollution are:
  - Stationary- factories, and plants
  - Mobile- cars, planes, and trains
  - Small- dry cleaners
  - naturally occurring- windblown dust
- Particulate Pollution 2.5 ($PM_{2.5}$) is solid and liquid substances in the air that have a diameter less than 2.5 μm. These fine particles are created by combustion. High levels of this can cause damage to the cardiovascular and respiratory systems, and worsen lung or heart disease.

- Ozone is smog created by NO_x, Volitale organic compounds, sunlight, and heat. High levels of this can cause damage to the respiratory systems, and worsen lung disease.
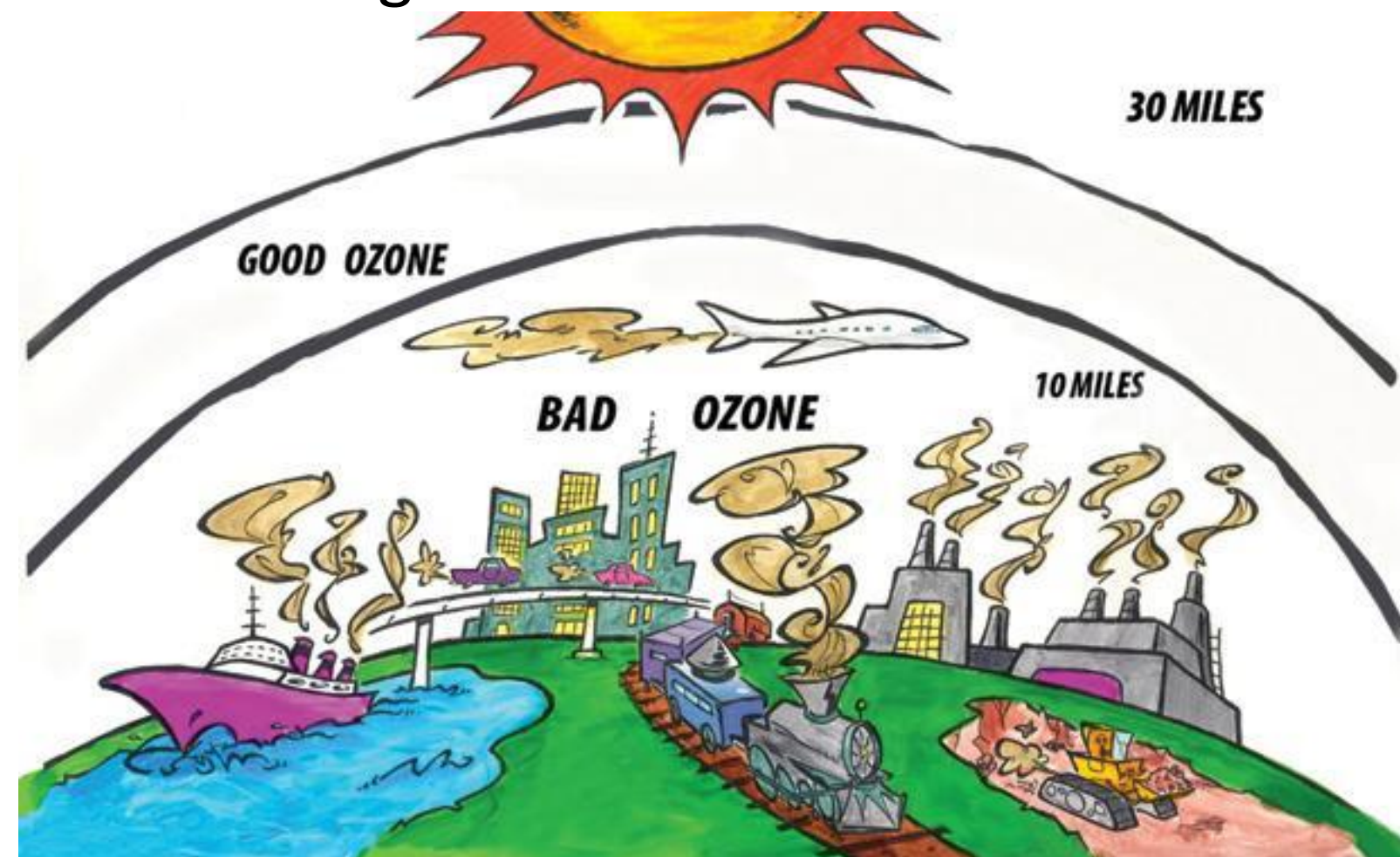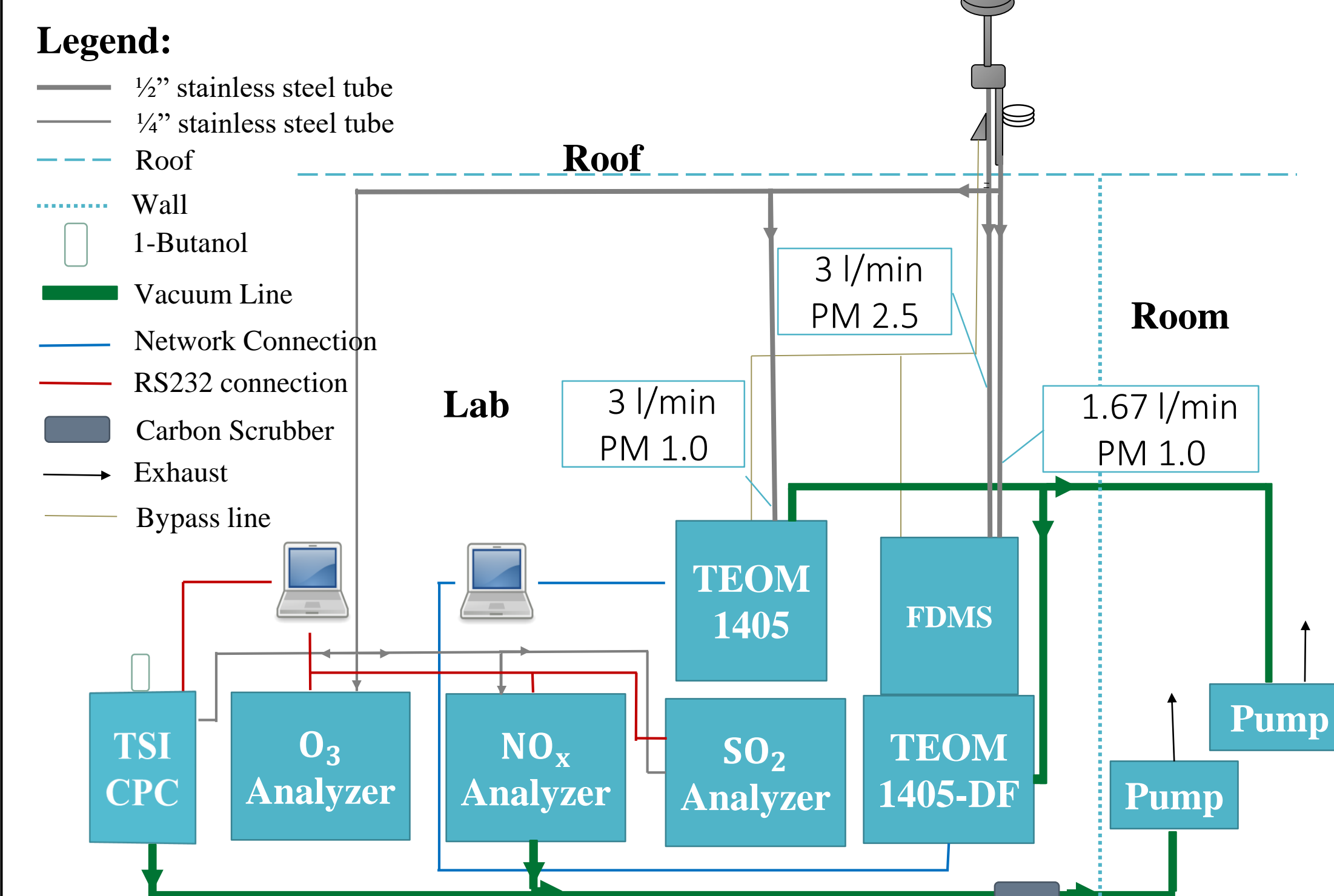

Air Quality Index Chart

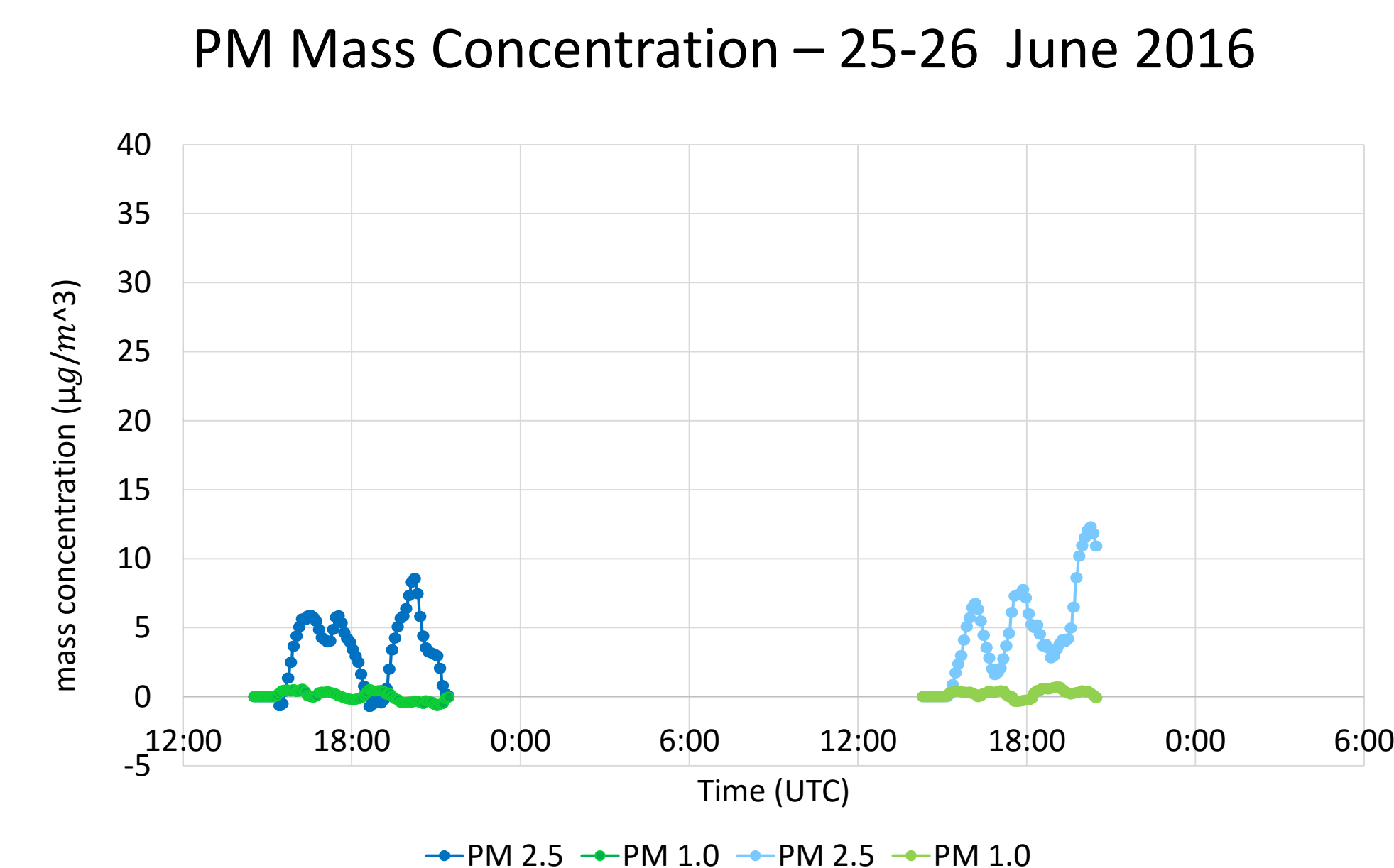| Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	..air quality conditions are:	...as symbolized by this color:
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

MATERIALS AND METHODS

- Instruments Used:
  - Tapered Element Oscillating Microbalance (TEOM) 1405-DF- measures $PM_{2.5}$ and $PM_{1.0}$ ($μg/m^3$)
  - TSI Condensation Particle Counter (CPC) 3771- counts the condensed particles ($\#/cm^3$)
  - Thermo Scientific 49C O3 analyzer - measure ozone concentration (ppb)
  - Thermo Scientific 42C NOx analyzer - measure NO_x concentration (ppb)
  - Thermo Scientific 49C SO2 analyzer - measure SO_2 concentration (ppb)
- Before the instruments were connected, they were arranged on the table.
- Stainless steel tubes were used for the inlet streams. Plastic tubes were used for the outlet streams and the bypass line. These tubes were connected by using Swagelok products.
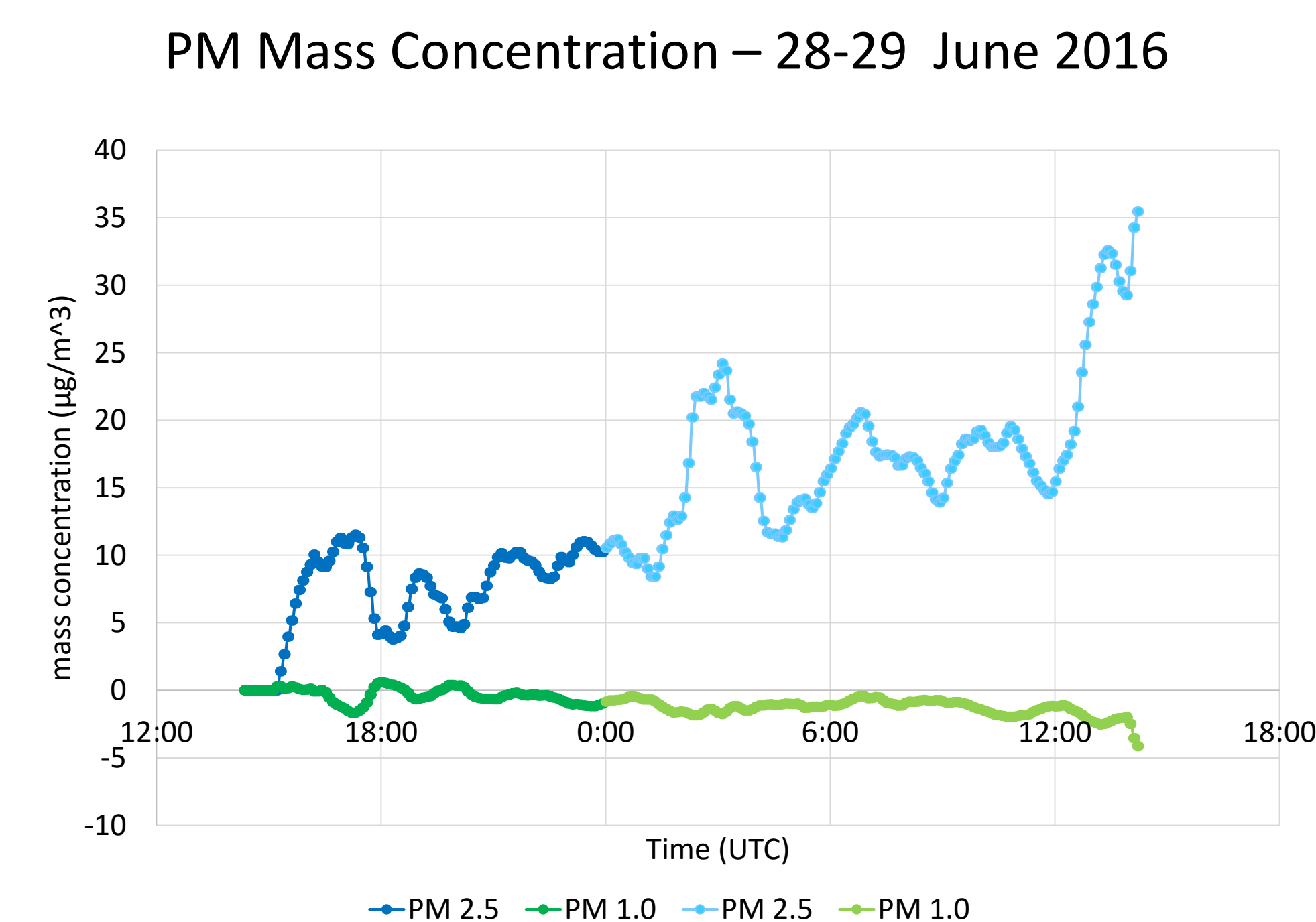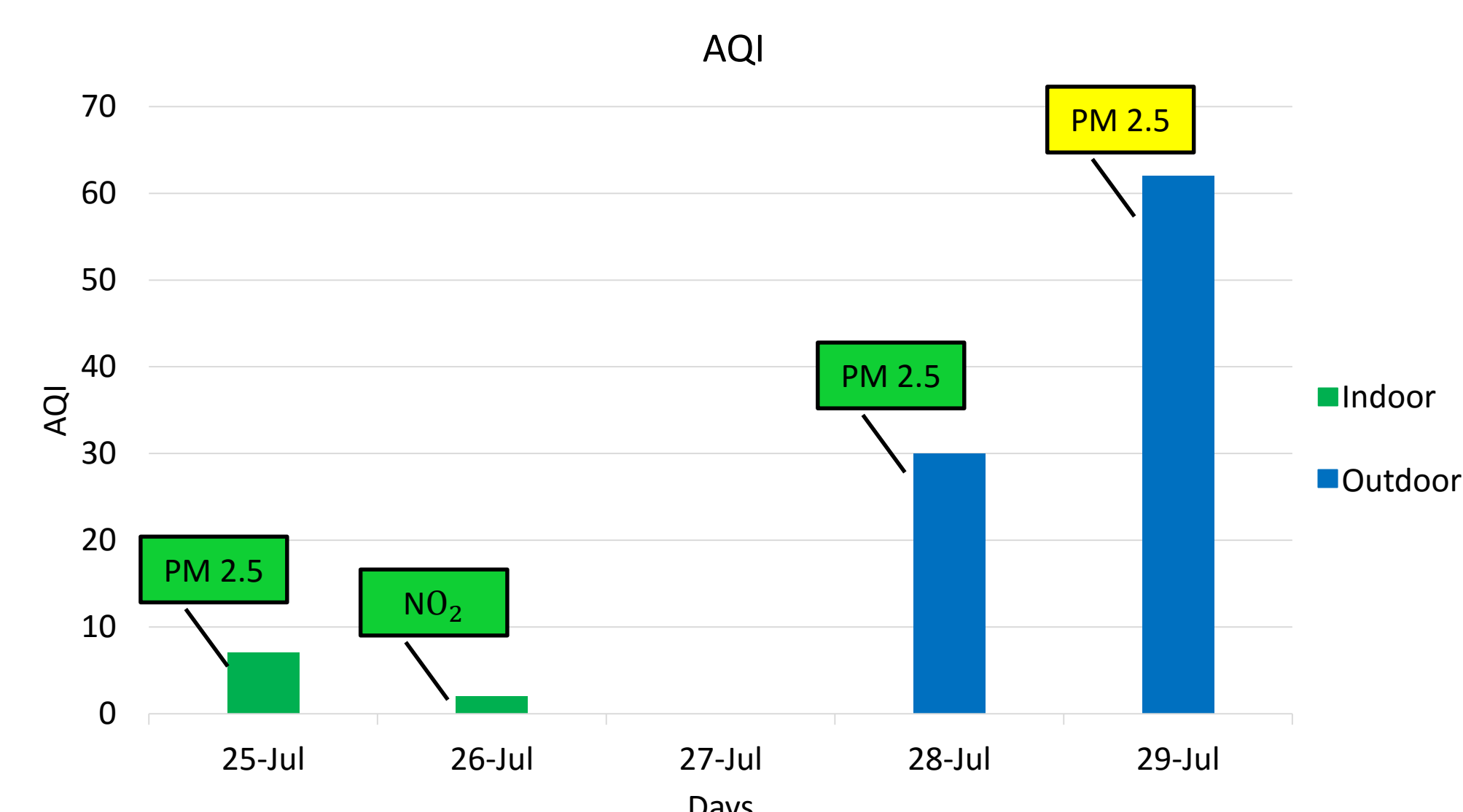
Legend:
- ½" stainless steel tube
- ¼" stainless steel tube
- Roof
- Wall
- 1-Butanol
- Vacuum Line
- Network Connection
- RS232 connection
- Carbon Scrubber
- Exhaust
- Bypass line

RESULTS

TEOM 1405-DF Indoors

PM Mass Concentration – 25-26 June 2016

TEOM 1405-DF Outside

PM Mass Concentration – 28-29 June 2016

Air Quality Index

- The captions on the AQI graph are the daily primary pollutants. The color of the captions resemble the levels of health concern.

CONCLUSIONS

- The TEOM 1405-DF results show that $PM_{2.5}$ weighs more than PM_1.
- The outside results show higher $PM_{2.5}$ concentration than the inside.
- According to the air quality index results, the inside air quality is better than the outside air quality.
- The air quality system setup is complete.
- Future Work:
  - Calibrate Instruments
  - Put data Online
  - Investigate why PM 1.0 values are so low

ACKNOWLEDGEMENTS

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