Instrumentation Plan

Indoor Air Quality Project 2015 Measurements Campaign

# Measurements

Measurements for the 2015 IAQ (Indoor Air Quality) project are segregated into practical groups:

* Occupancy, consisting of the Smart Home sensor kits;
* Background, with AQ sensors complementing the Smart Home kit deployed year-round
* Intensive, where the home is highly instrumented for a short portion of the year
* Tracer, a subset of the intensive measurements involving a tracer gas

## Occupancy

Once installed, the Smart Home kits are largely autonomous. Even the need for Internet access can be circumvented by periodic on-site wireless data retrieval. Relevant measurements provided include:

* Temperature
* Door use
* Motion
* ?
* ?
* ?
* ?
* ?

## Background

Implementation of year-round IAQ measurements is under discussion. Desired metrics include:

* Particulate matter, resolved to fine/coarse (Dylos sensor)
* Ventilation
  + Exhaust fan use (kitchen, bathroom, attic, ?)
  + Intake fan use (central HVAC)
  + Window use
  + Building leakage [*contract out, do one-time measurement*?]
* Temperature gradients

Measuring ventilation is the most difficult to do well. Acoustic sensors, hot wire anemometers and reed switches are under consideration.

## Intensive

During the intensive measurement period, instruments are either ‘indoor’ or ‘indoor/outdoor’ samplers.

### Indoors

Within the home, the instrument suite is concealed in an aesthetically appealing 19” rack. Ambient air is sampled via PFA tubing (SS for DustTrak; n/a for Dylos) and devices are responsible for their own flow control. Hardware for DAQ, control and communications are present in the rack:

* DustTrak II (8530) (PM 1, 2.5, 4 or 10)
* Dylos (coarse/fine PM)
* Licor LI-840A (CO2/H2O)
* 2B Tech Model 106 (O3)
* 2B Tech Model 405 (NO/NO2/NOx)
* Adsorbent tube samplers, 16-port carousel, and pump
* TECO Model 48 (CO)
* CSI CR3000 (datalogger) + display
* to-be-identified (COTS wifi router)

A cellular modem will provide internet access independent of the homeowner. It’s not yet clear whether that modem will be located in the ‘end table’ instrument rack or with the ‘indoor/outdoor’ instrument suite. Practically it makes no difference: a second COTS wifi router can provide a bridge, if necessary.

Instruments which sample ‘indoor/outdoor’ will be located in a **TBD** location, probably the garage, a storage pod or a small trailer. Air will be continuously drawn from both inside and outside the home through large (1/2” or 5/8”) PFA tubing [**need second pump?**] and a subsample stream will be taken alternately from each line using a 3-way valve and third, smaller pump. Instruments will be able to draw their own samples from the subsample stream, which overflow-exhausts.

* PTR-MS (speciated VOC)
* DustTrak (old Model 8520)
* Licor LI-840A (CO2/H2O)
* 2B Tech 106-series (O3)
* TECO Model 42c (NO2/NO2/NOx)

Some instruments will only measure outdoor conditions:

* Airmar 200WX (weather)