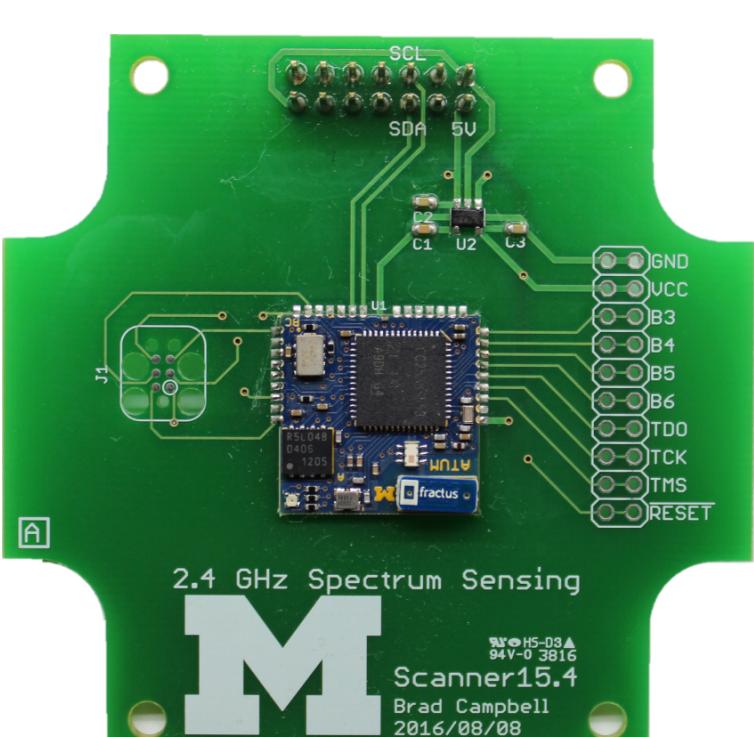


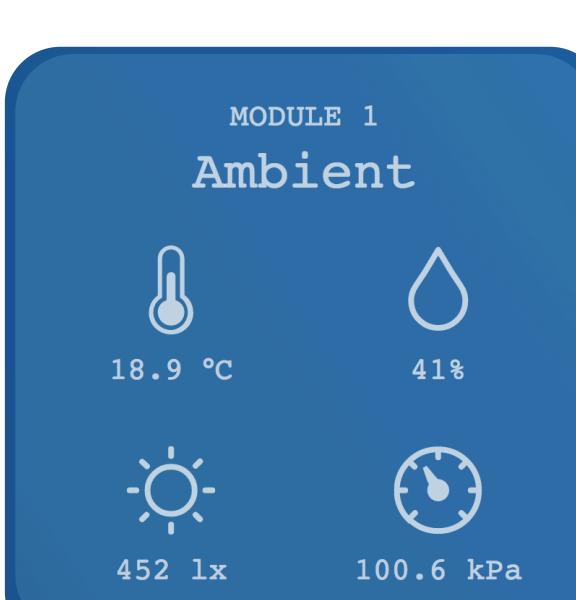
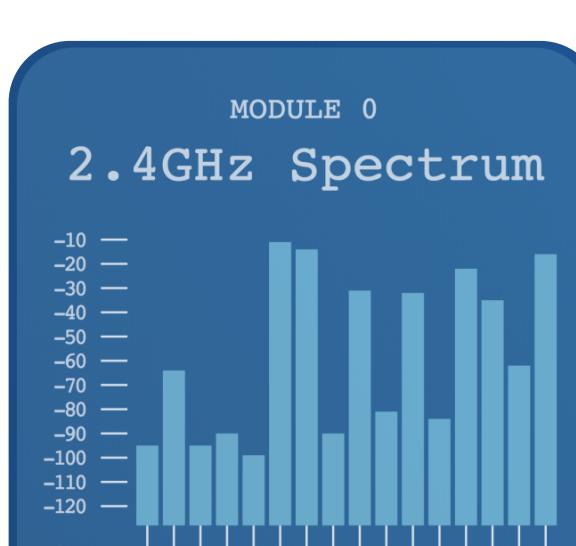


**Modular Design** makes the signpost a plug-'n-play testbed for urban sensing, facilitating integration of a diverse array of sensing modalities. Researchers, citizen scientists, city planners, or any other interested parties can add to the platform, without compromising other modules. Implementing the controller and power management as modules allows for future system improvements with minimal impact on infrastructure. The signpost backplane provides connection and isolation, leaving management to the modular controller module.

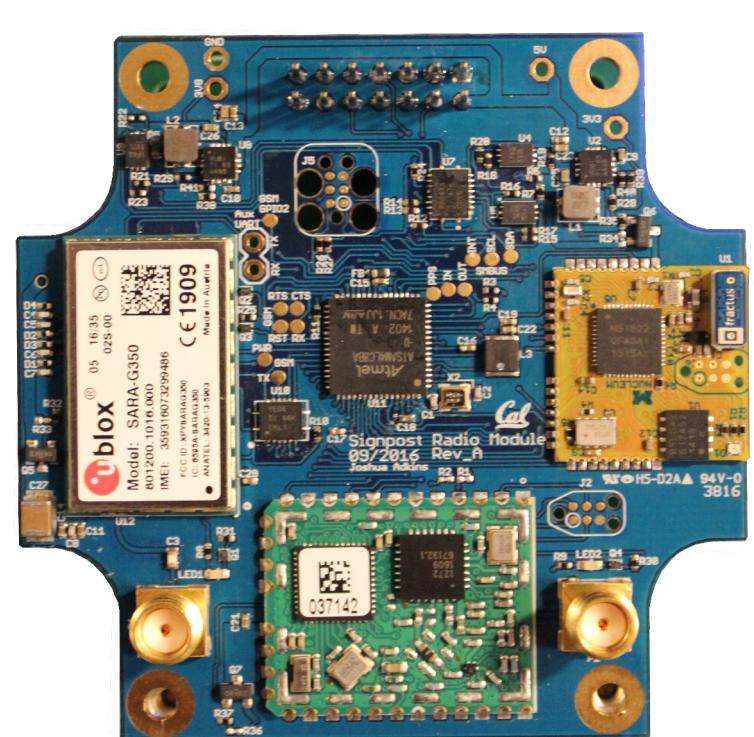
## RF Spectrum



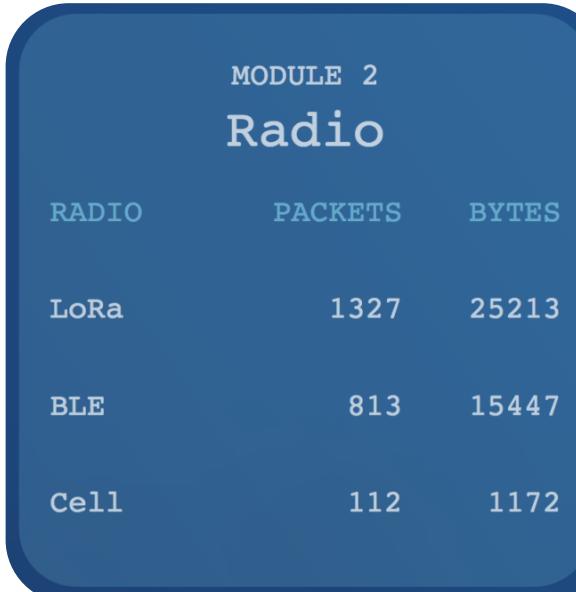
- Measure energy in each 802.15.4 spectral band
- City-wide spectrum usage data critical for whitespace applications and regulations



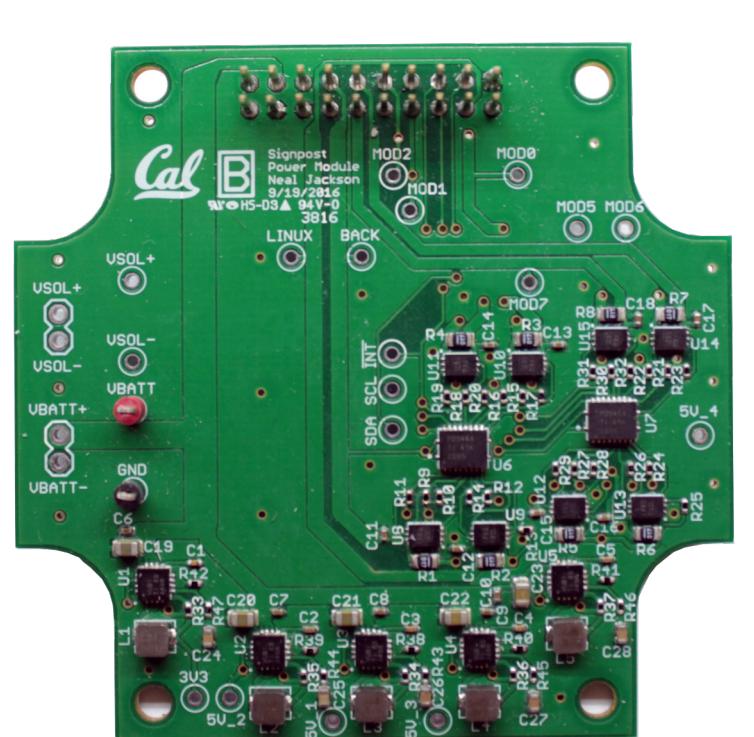
## Radio



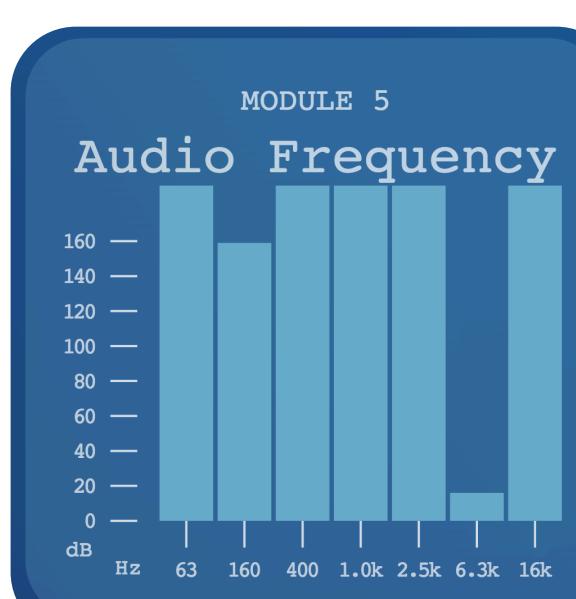
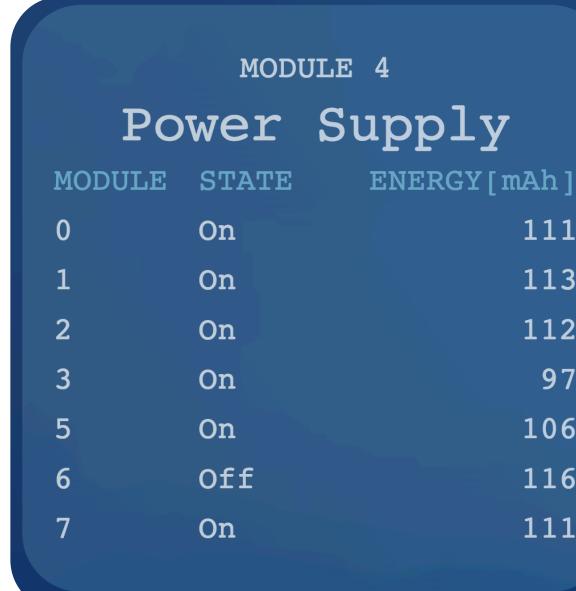
- Communicate signpost data
- Bluetooth** – Local data to support immediate user engagement
- LoRa** – Low energy, low data-rate, long-range
- Cellular** – Higher energy, high bandwidth, long-range



## Power



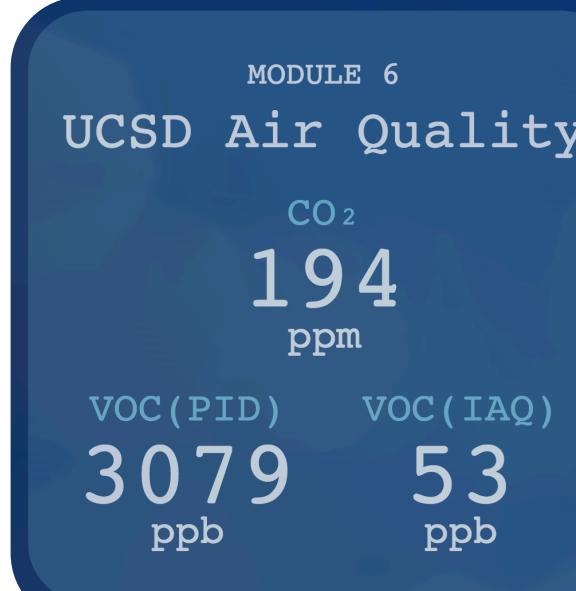
- Monitor energy input, battery charge state
- Regulation and monitoring of power for each module
- Enables controller to enforce arbitration rules upon modules



## UCSD Air Quality

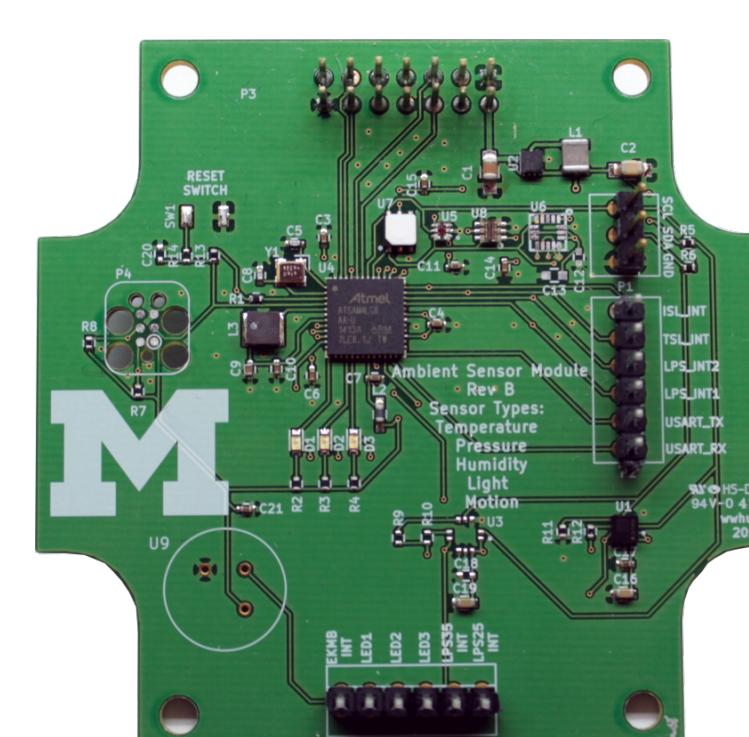


- Third-party sensing module integrated with signpost
- Measures environmental health data
  - Urban air quality can vary block-to-block, demands high fidelity sensing

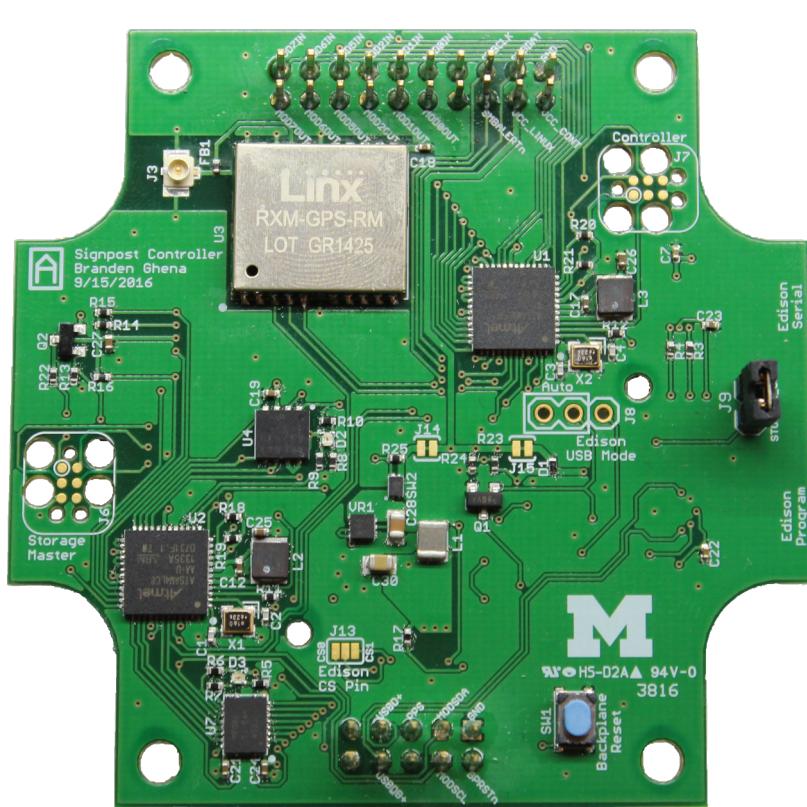


## Ambient Environmental

- Classical environmental measures
  - Temperature, pressure, humidity, ambient light
- Allows sensitive sensors to compensate for local environmental factors

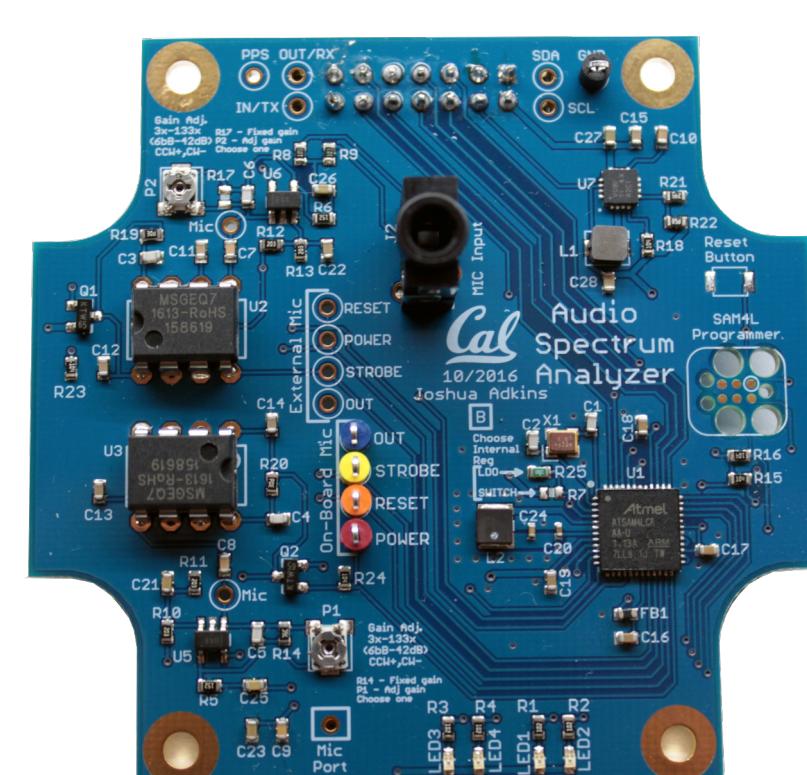


## Controller



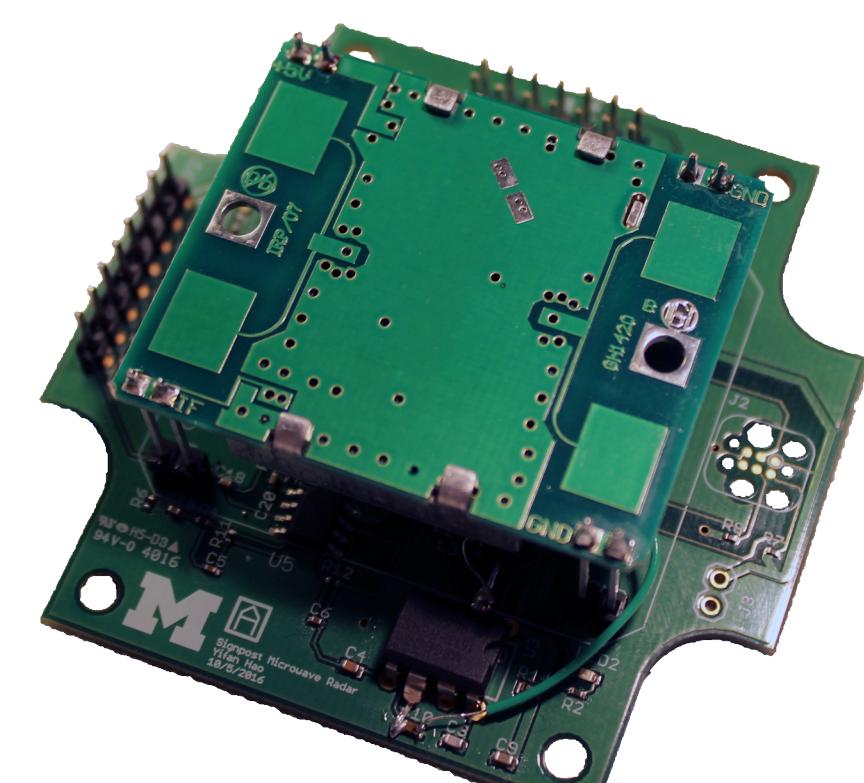
- Monitor & protect operations
- Control power, I<sup>2</sup>C, and USB isolation of each module
- Long-term storage of large volume data
- Duty-cycled Linux for balancing power, computation
- GPS for location, timestamp
  - Sync pulse to each module

## Audio



- Sample energy across the audio spectrum
- Background noise levels important to citizen health
- Raw audio never captured, protecting privacy

## Microwave Radar



- Motion tracking around the signpost
- Pedestrian counting without identifying individuals, preserving privacy
- 10 GHz radar balances energy and fidelity

