

New Air Quality Measurement Tools



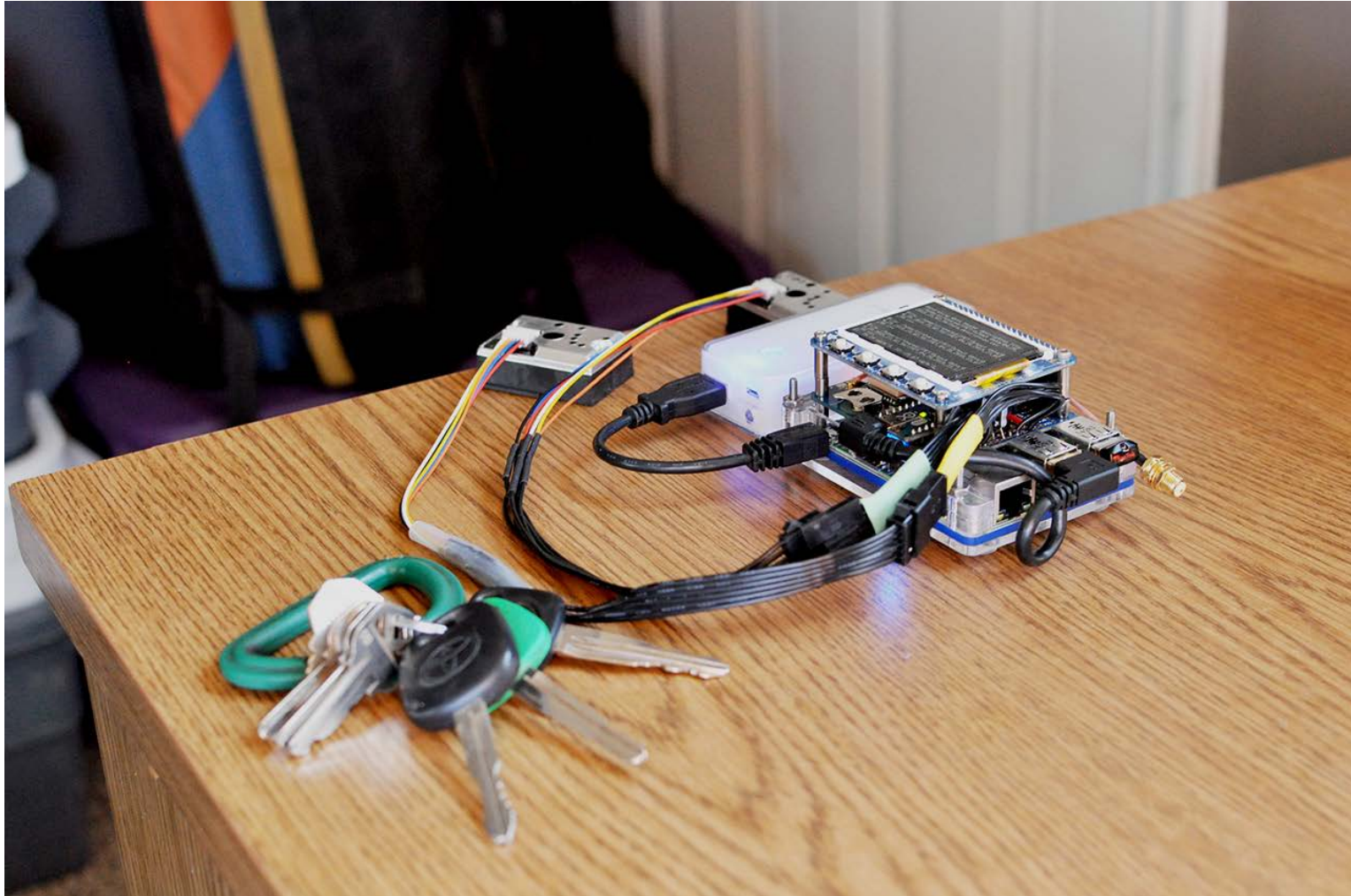
GBUAPCD

06/09/2015

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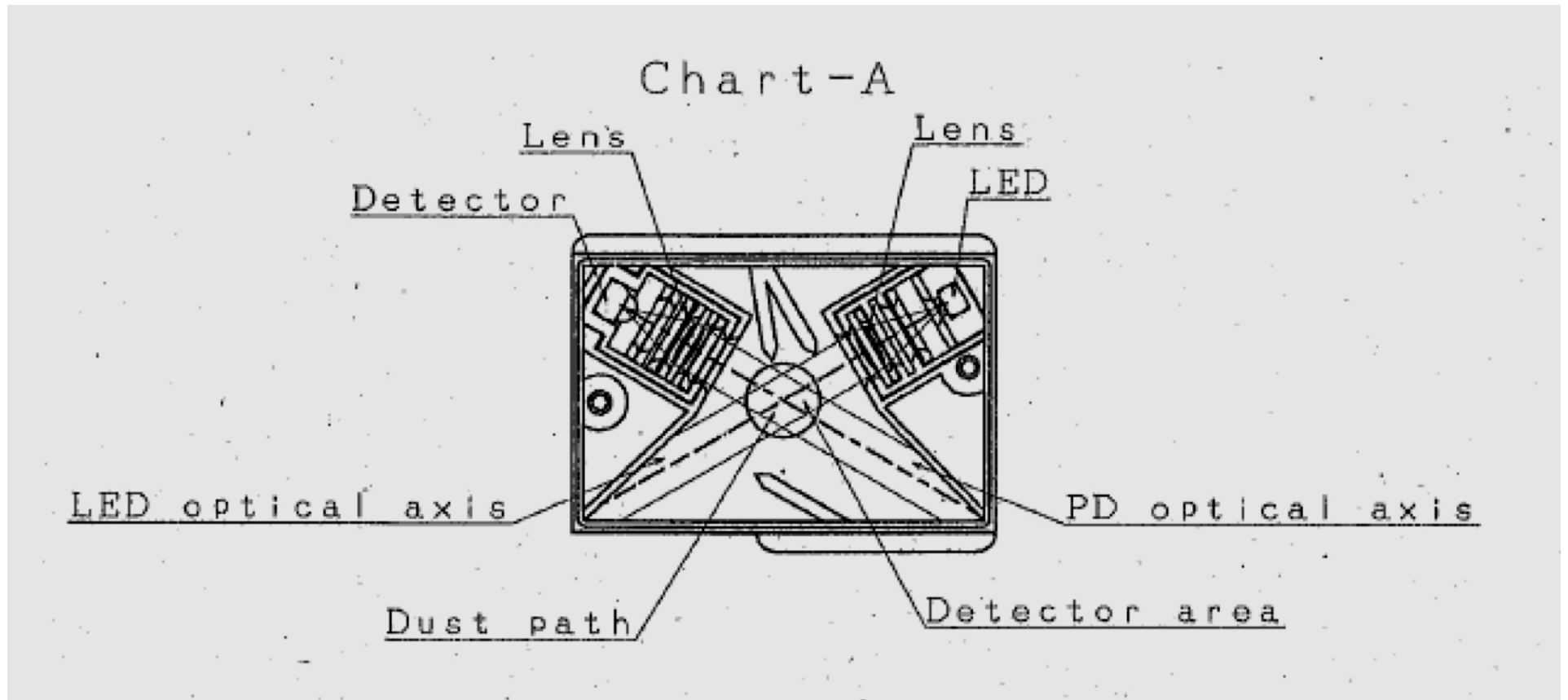
New air quality measurement tools



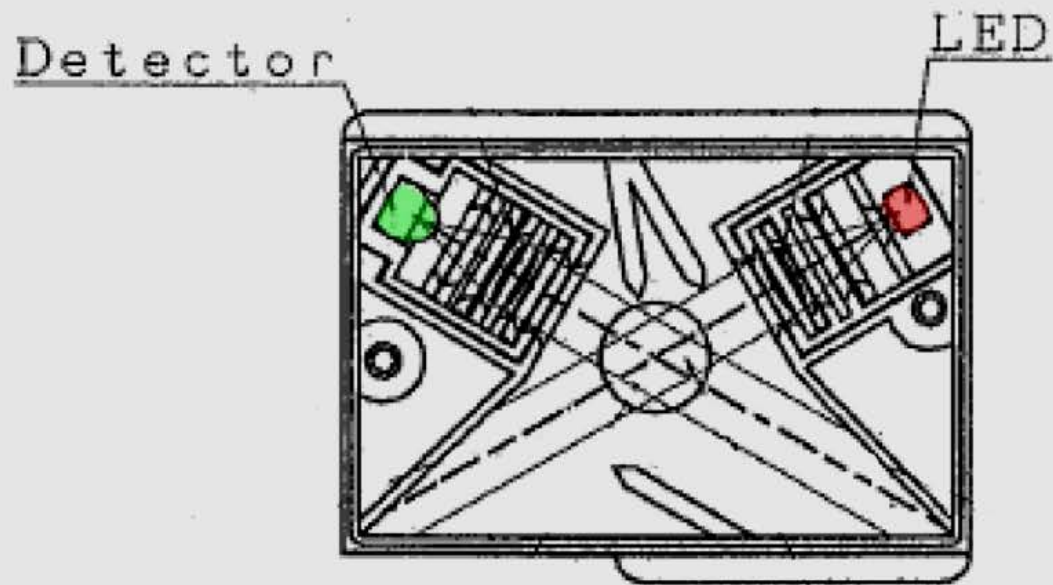
Sharp dust sensor



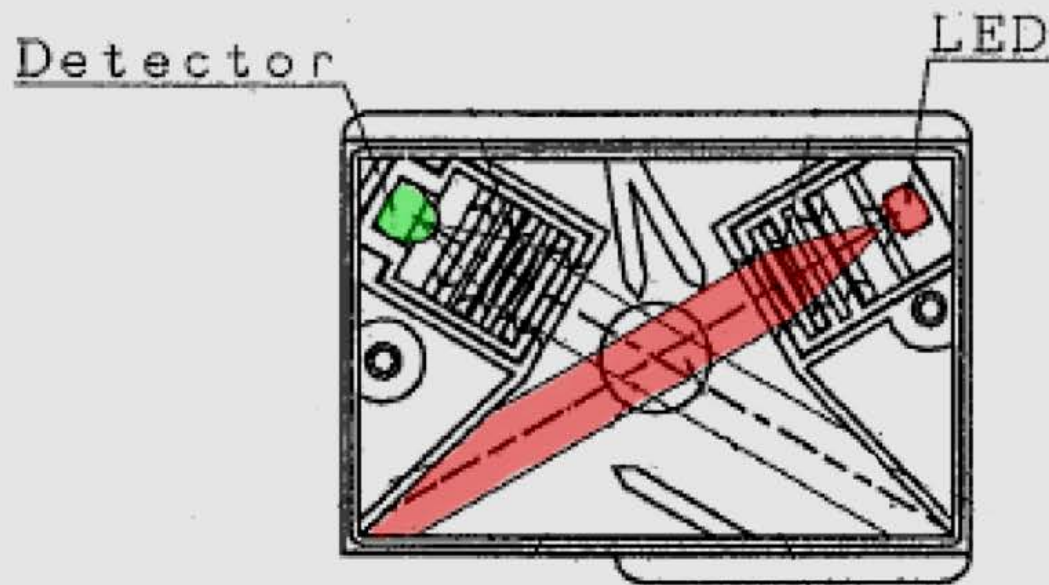
Sharp dust sensor



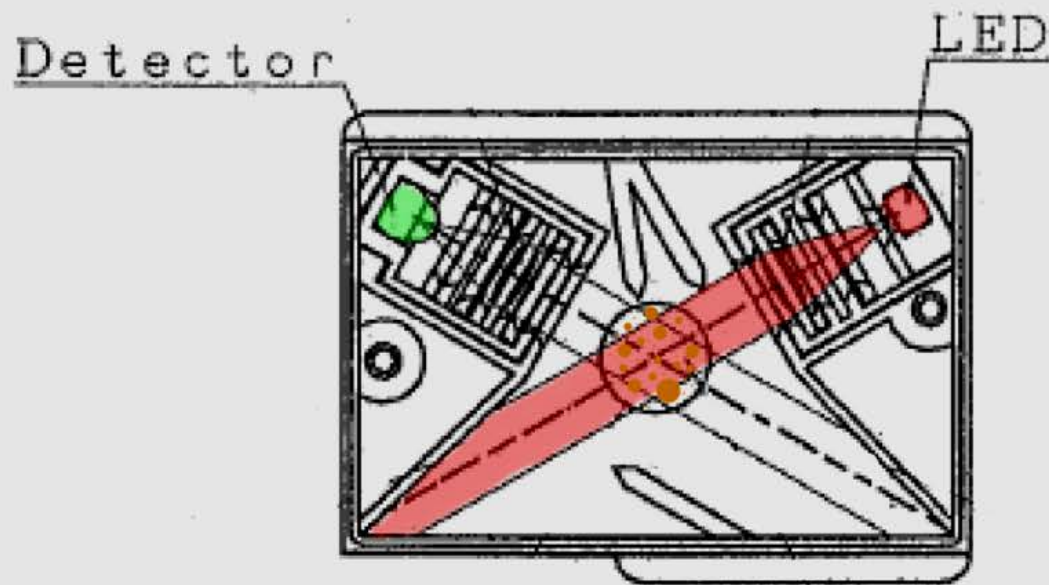
Sharp dust sensor



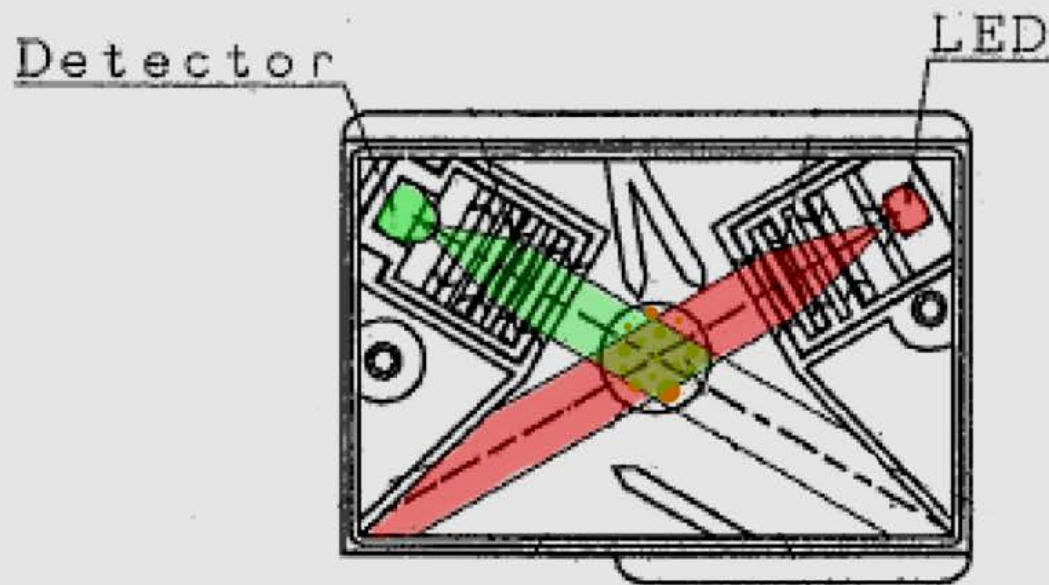
Sharp dust sensor

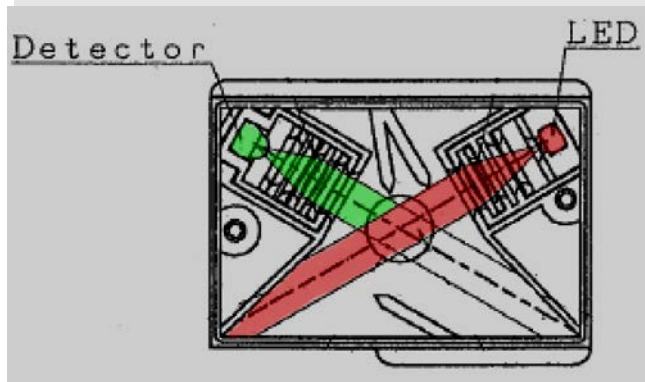


Sharp dust sensor

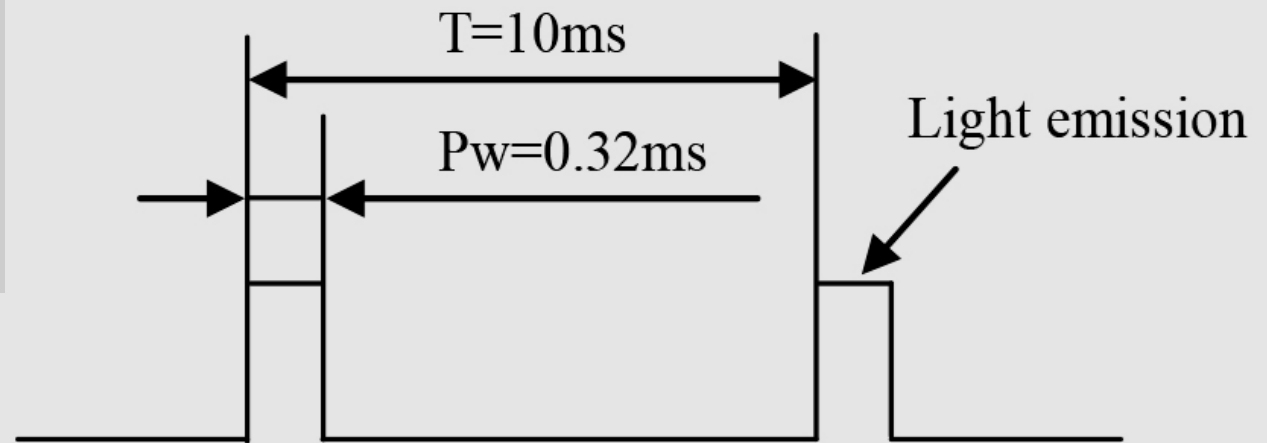


Sharp dust sensor



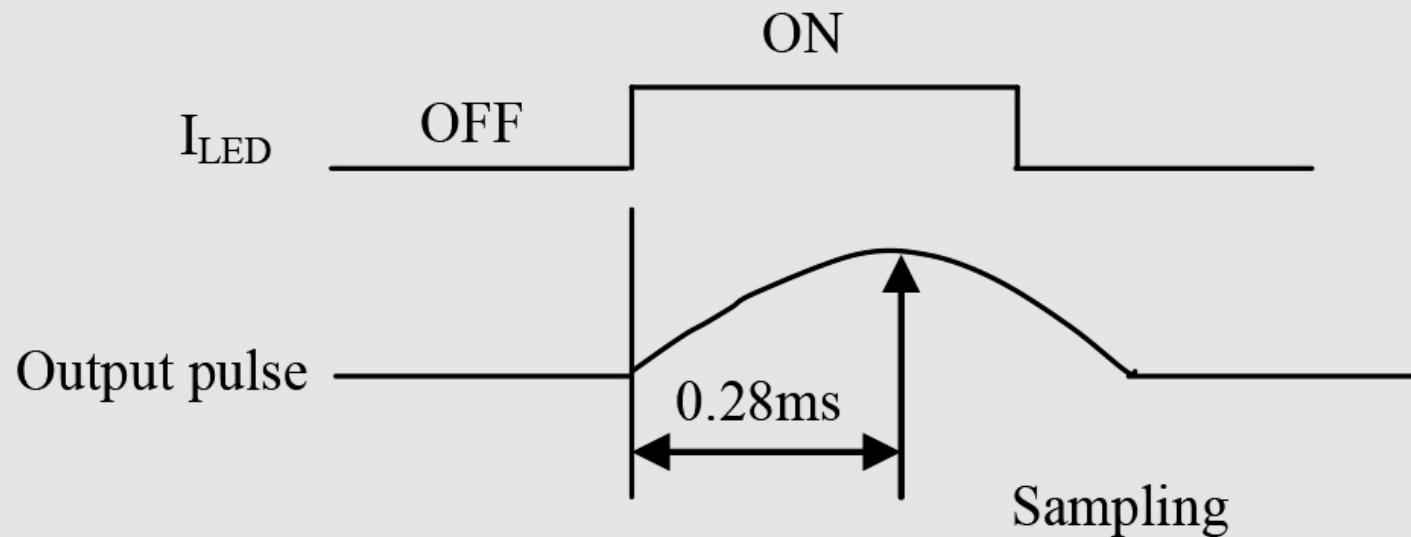


Sampling timing of output pulse

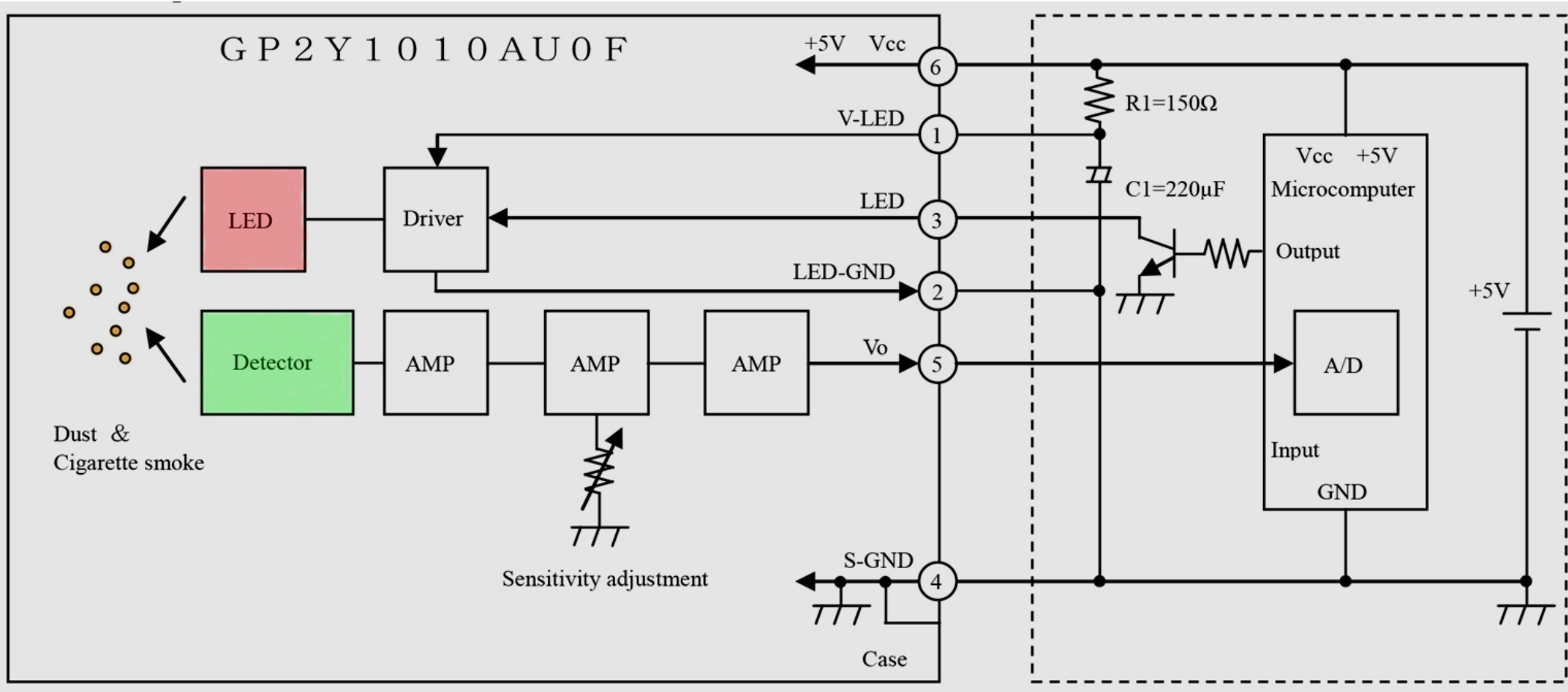


10ms pulse interval means 100 samples/second

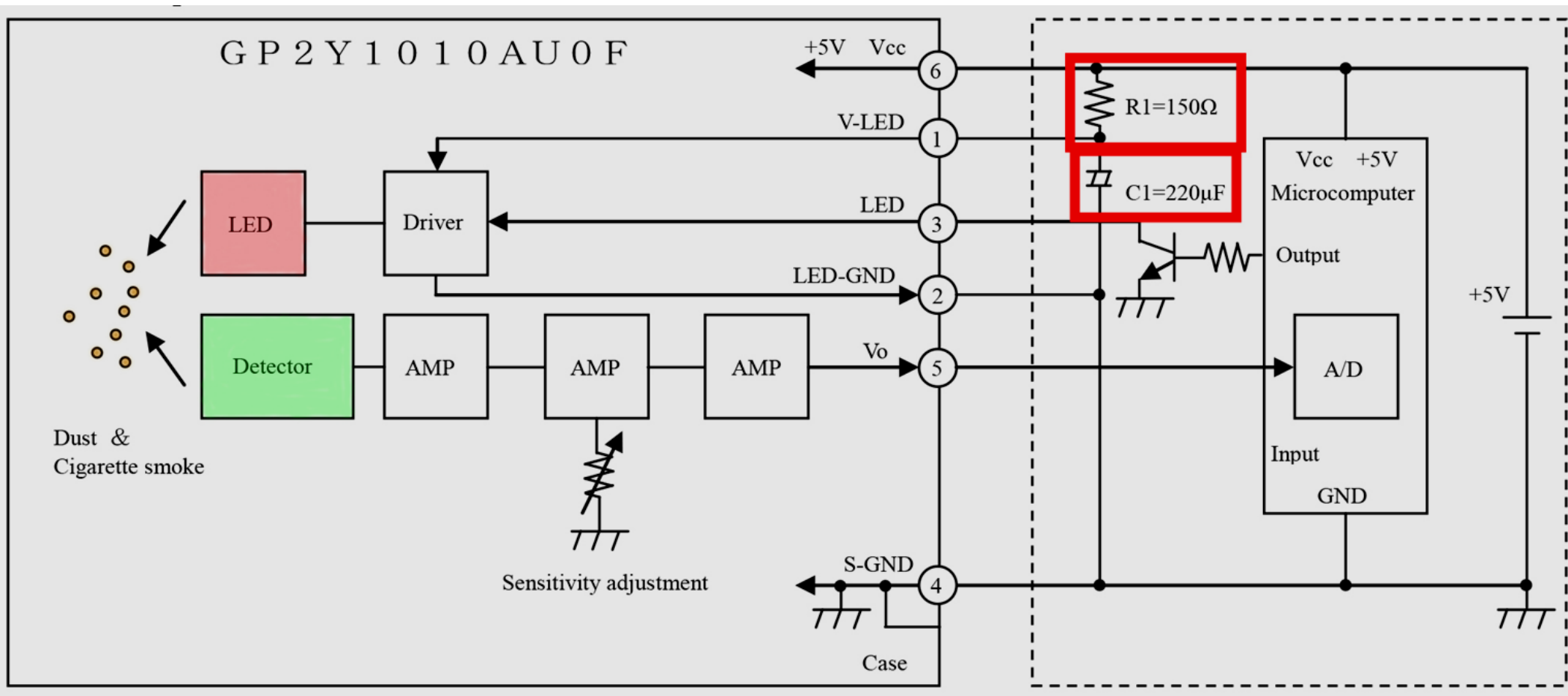
.32ms = 320 microseconds



Sharp dust sensor

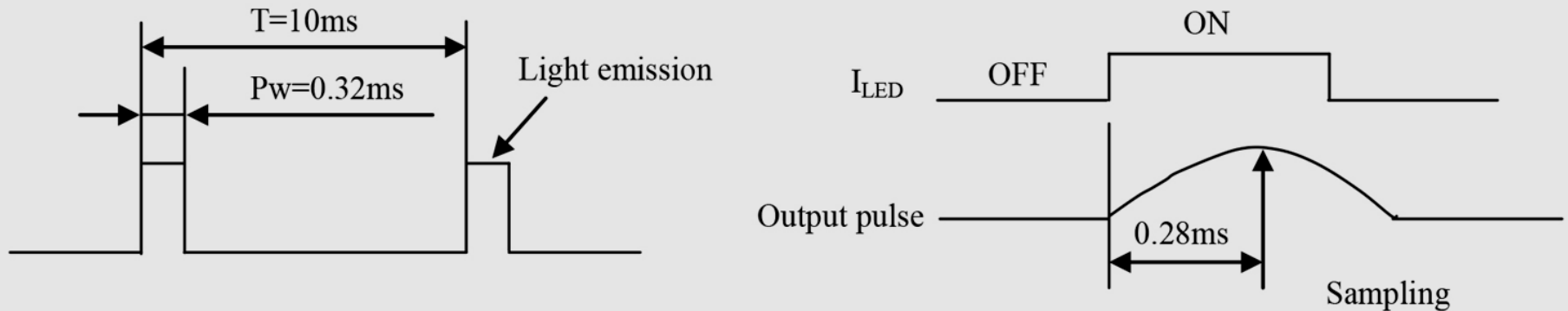


Sharp dust sensor

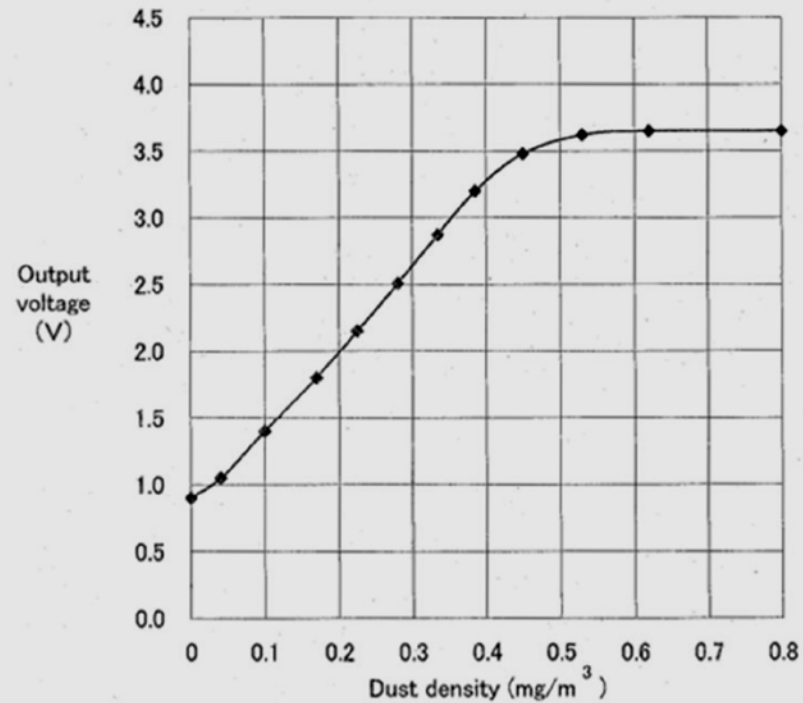


Sharp dust sensor

Sampling timing of output pulse



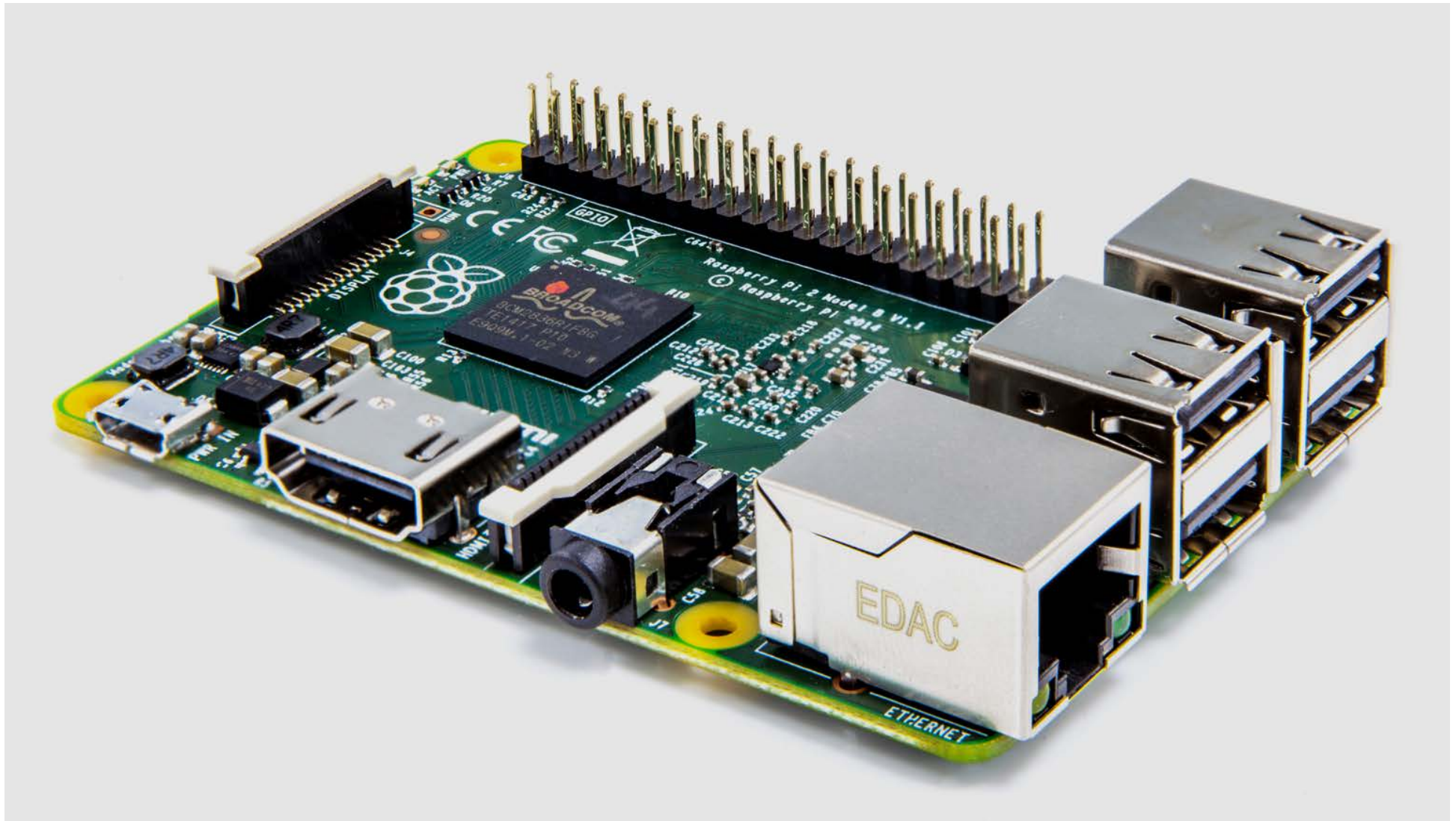
Dust density characteristics (Example)



Sharp dust sensor

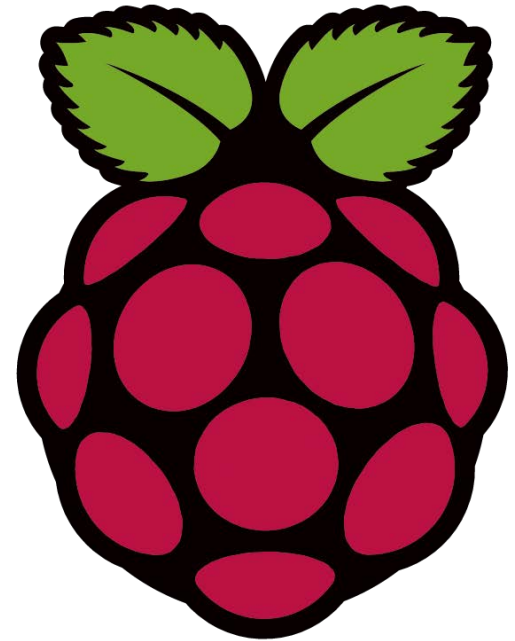
- Sharp electronics GP2Y1010AU0F
- Optical air quality sensor
- Infrared emitting diode and photo-transistor
- Low current consumption 11mA typical
- Sensitivity $.5V/0.1mg/m^3$
- \$11.95 from Sparkfun electronics
- Requires some additional circuitry and PWM to operate correctly (RC timing)

Raspberry Pi

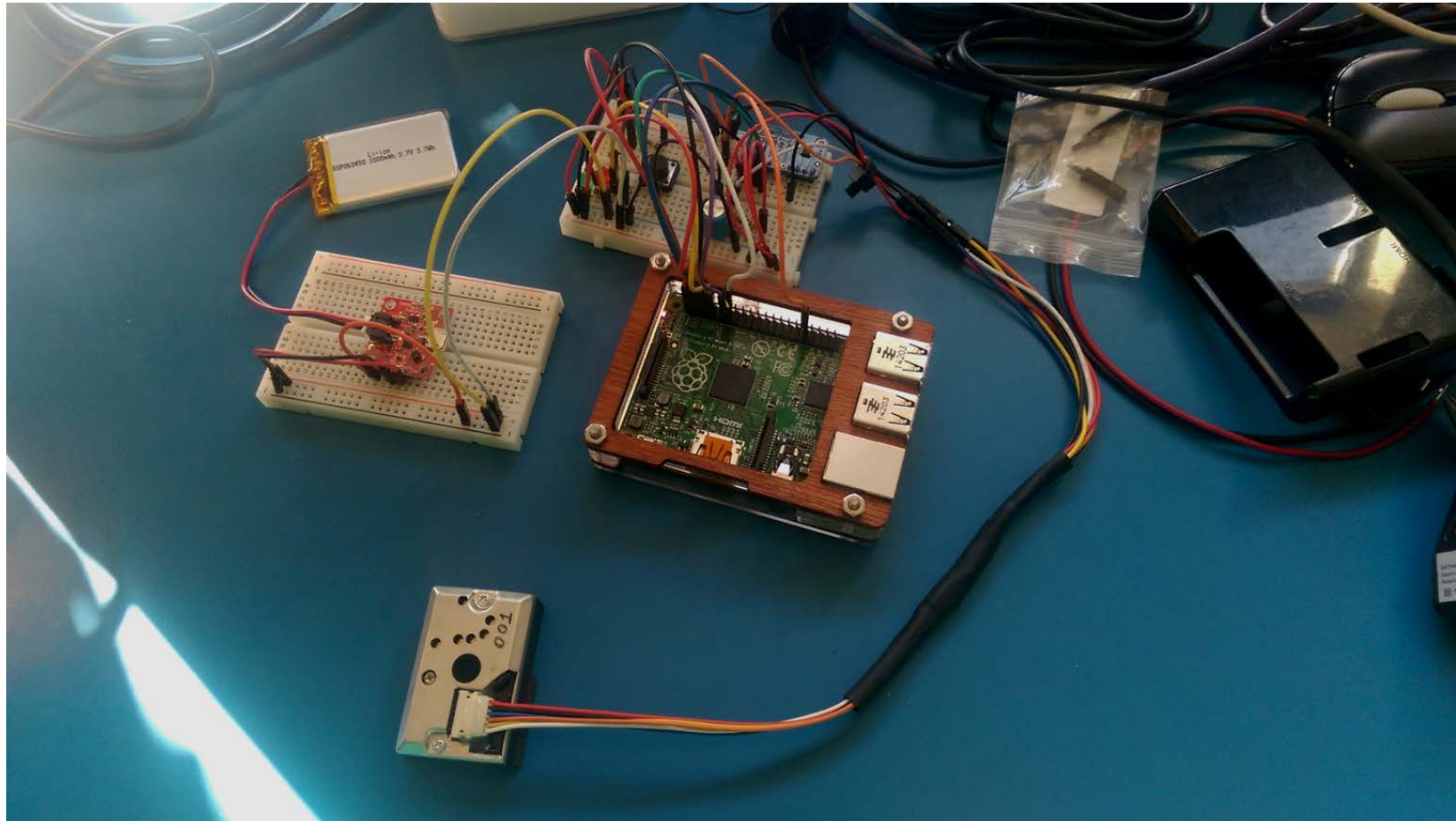


Raspberry Pi

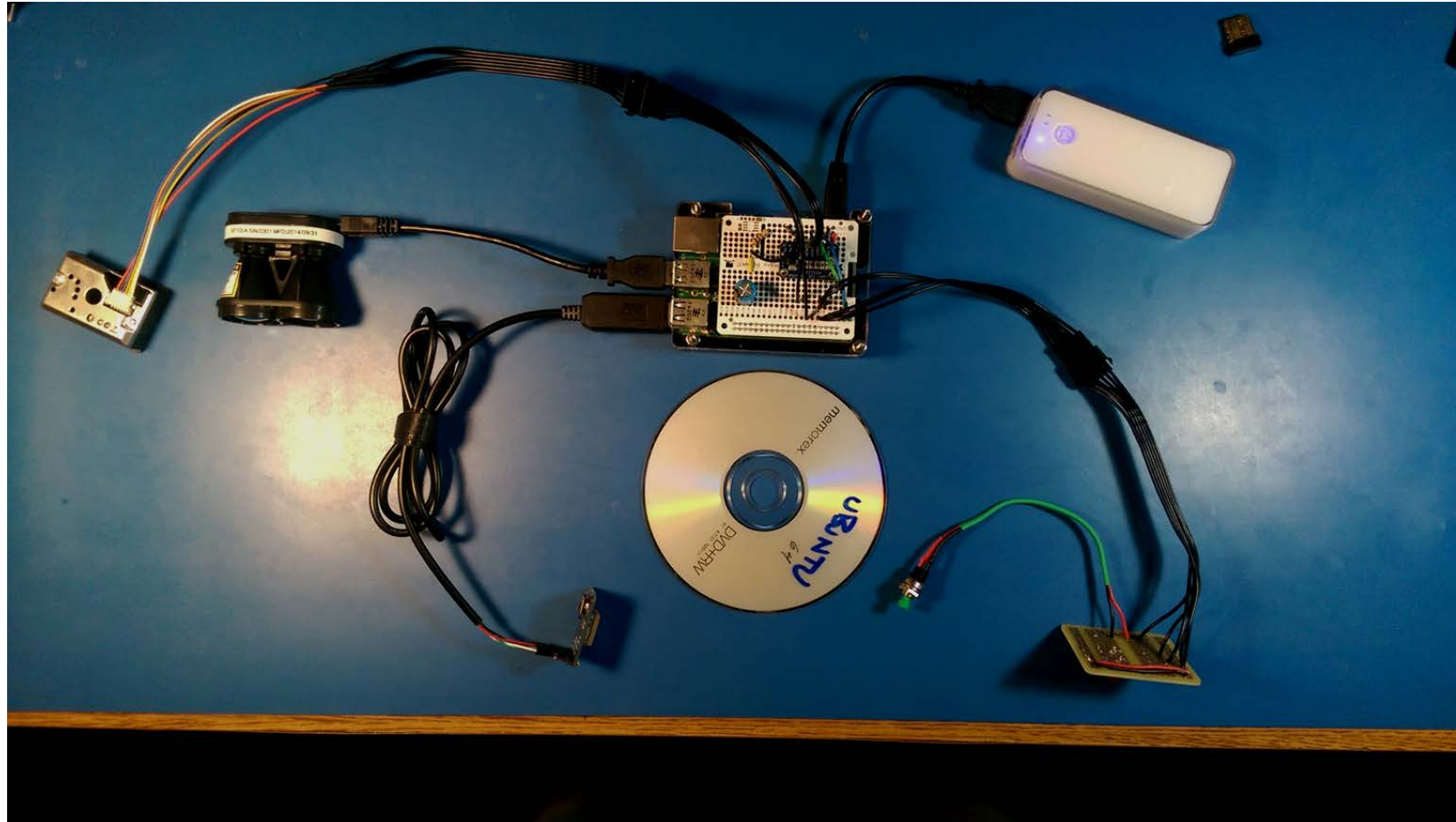
- .Credit card-sized single board computer (ARMv7)
- .Runs Linux and soon Windows 10
- .USB keyboard and mouse
- .Ethernet port and built in NIC
- .4 USB ports
- .HDMI monitor output
- .40 programmable GPIO pins
- .1GB RAM, Quad core 900MHz processor
- .Operating system programmed on microSD card
- .Once set up, you can just make copies of the disc
- .Cost: \$35



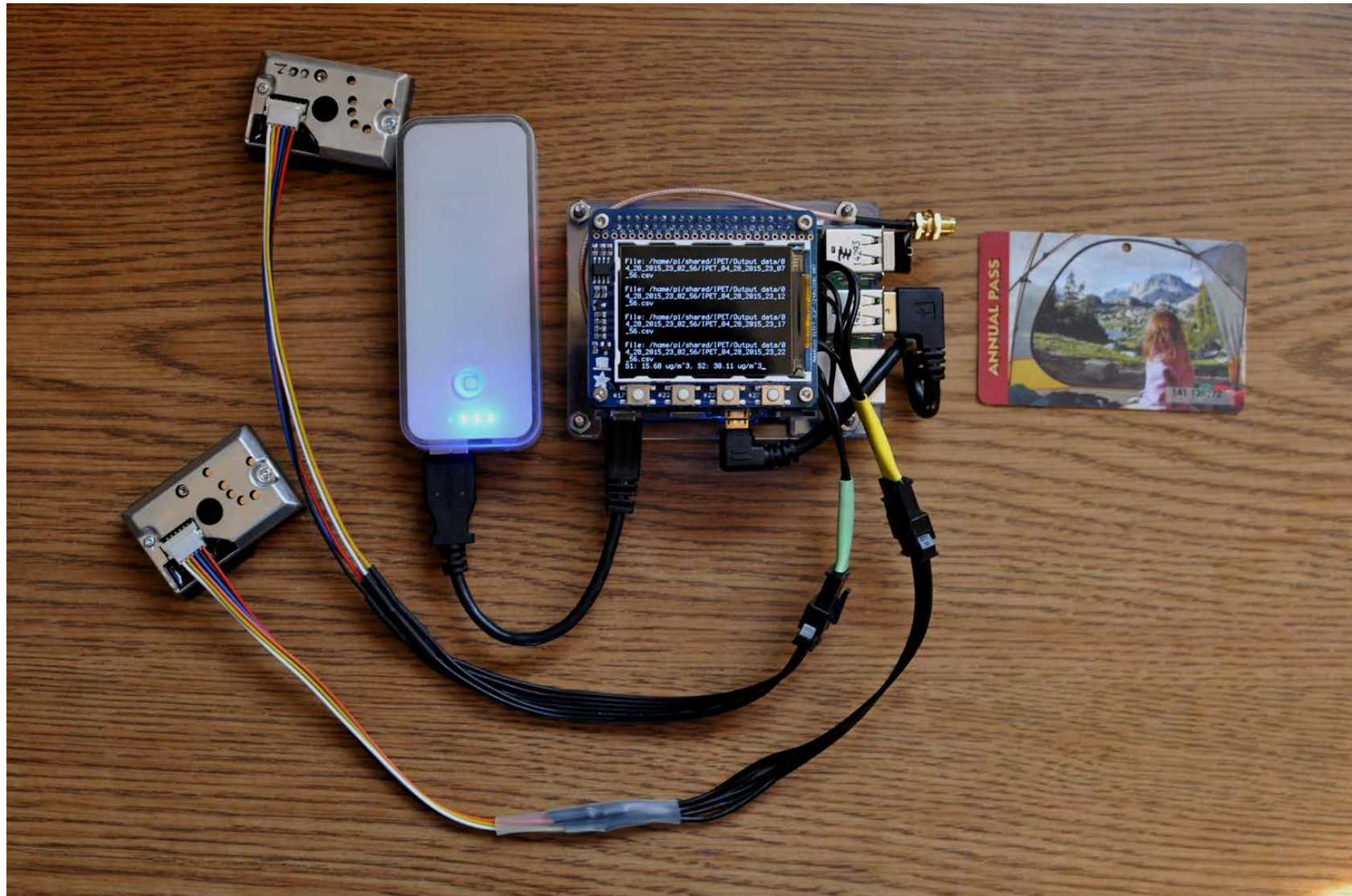
Version 1.0



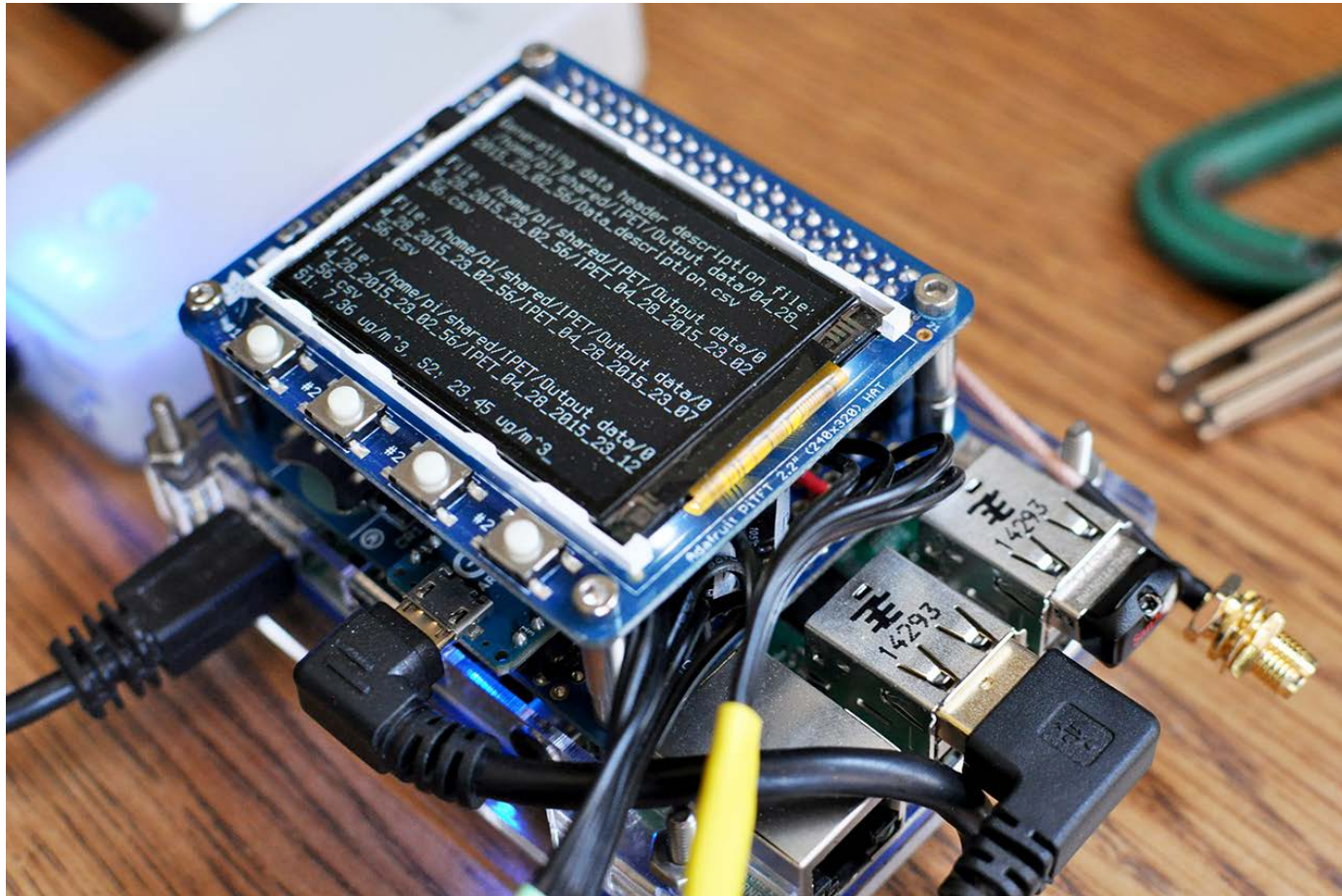
Version 2.0



Version 3.1



Version 3.1



Features of the Platform

- Data stored automatically on attached SD storage. No special tools, cables, tablets needed to retrieve data or run the system!
- System time automatically updated via GPS
- System location known from GPS
- Automatic generation of data maps viewable in Google Earth
- Network connections via:
 - Ethernet
 - Wifi
 - 3G
 - Bluetooth



open source

Features of the Platform

(continued)

- SSH, VPN, and webserver hosting
- Firewall and intrusion detection system
- Ad-hoc wireless access point
- Built with 100% Open source software
- 100% Free!

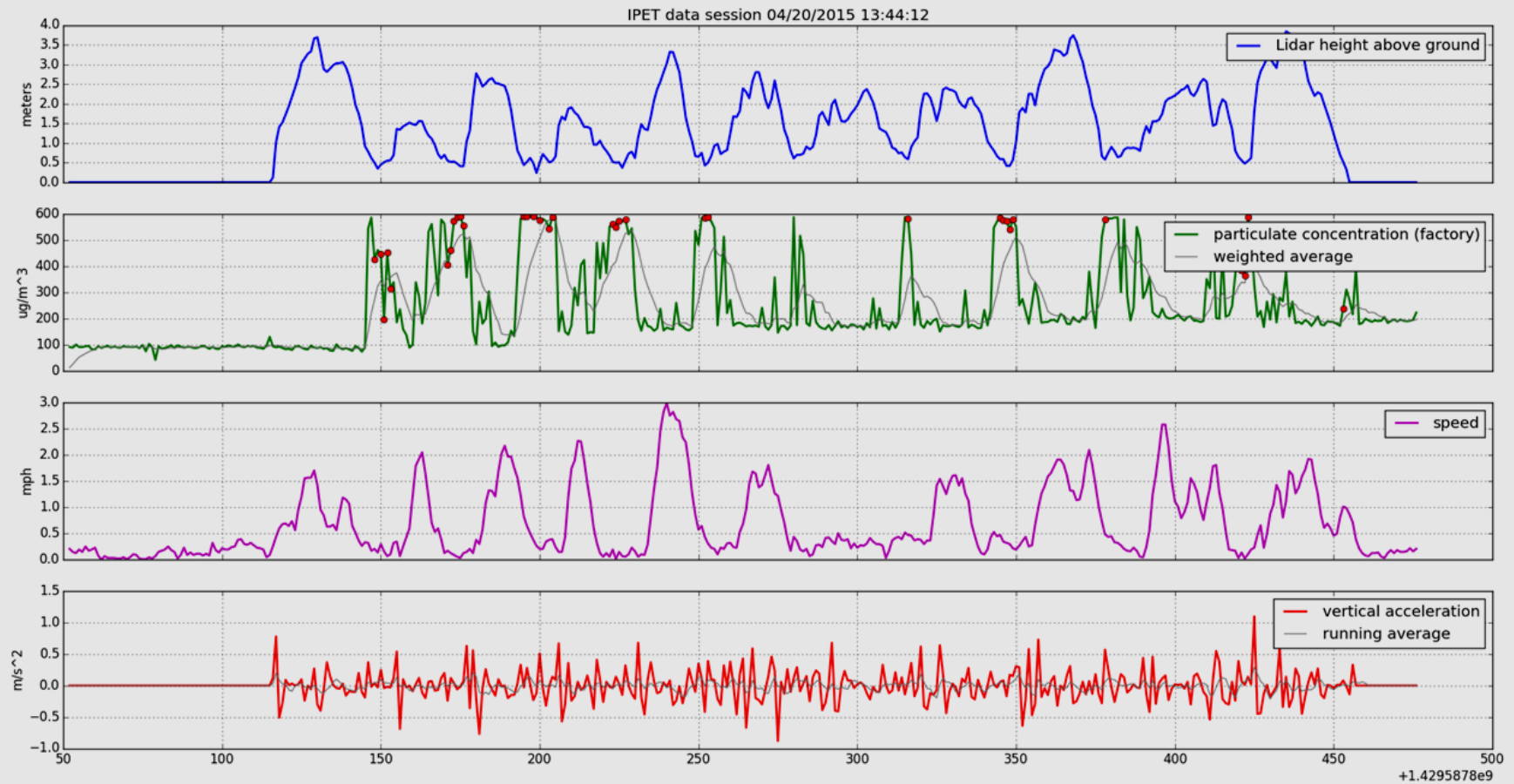
Platform parts list

Name	Quantity	Unit Price	Total Price
Raspberry pi 2	1	\$39.95	\$39.95
MicroSD card	1	\$11.95	\$11.95
Ultimate GPS pihat	1	\$44.95	\$44.95
SMA to uFL RF Adapter cable	1	\$3.95	\$3.95
GPS Antenna - External active	1	\$12.95	\$12.95
Arduino Micro	1	\$24.95	\$24.95
Micro USB cable 90 degree	1	\$6.99	\$6.99
pitft screen	1	\$24.95	\$24.95
Sharp sensor	2	\$11.95	\$23.90
Sharp sensor connector cable	2	\$1.18	\$2.36
6 pin JST connector	2	\$1.50	\$3.00
150 ohm resistor	2	\$0.02	\$0.04
220 uF capacitor	2	\$0.10	\$0.20
Raspberry pi case	1	\$14.50	\$14.50
Battery	1	\$24.95	\$24.95
Micro USB cable	1	\$5.99	\$5.99
32GB USB external memory	1	\$14.99	\$14.99
		Total	\$260.57

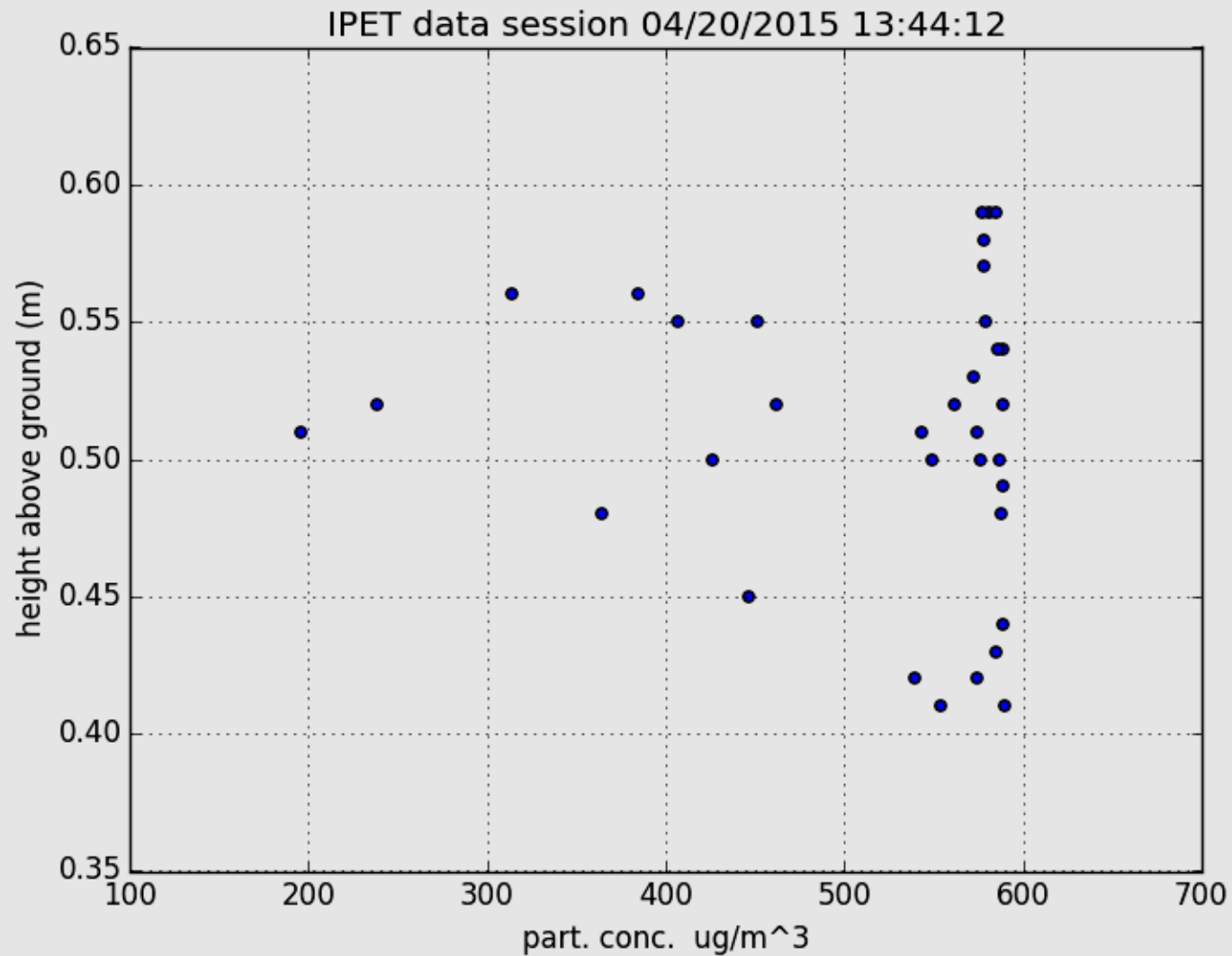
Applications for GBUAPCD

- Ability to measure air quality on a local scale (micro climate studies)
- IPET drone-based monitoring platform
- Personal air quality monitor
- Rapidly deployable network short term applications
- Strength in numbers!

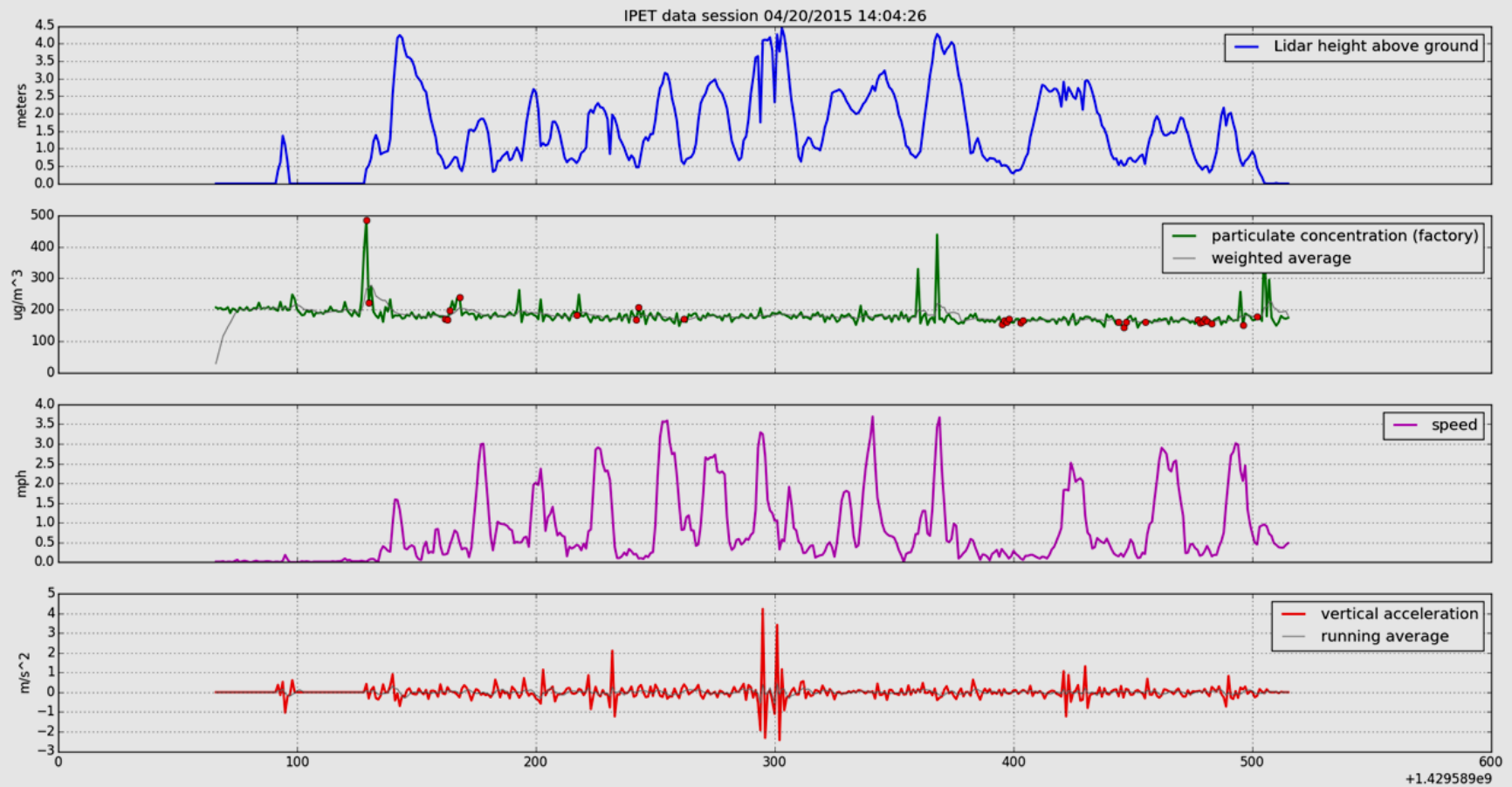
IPET data (Salts)



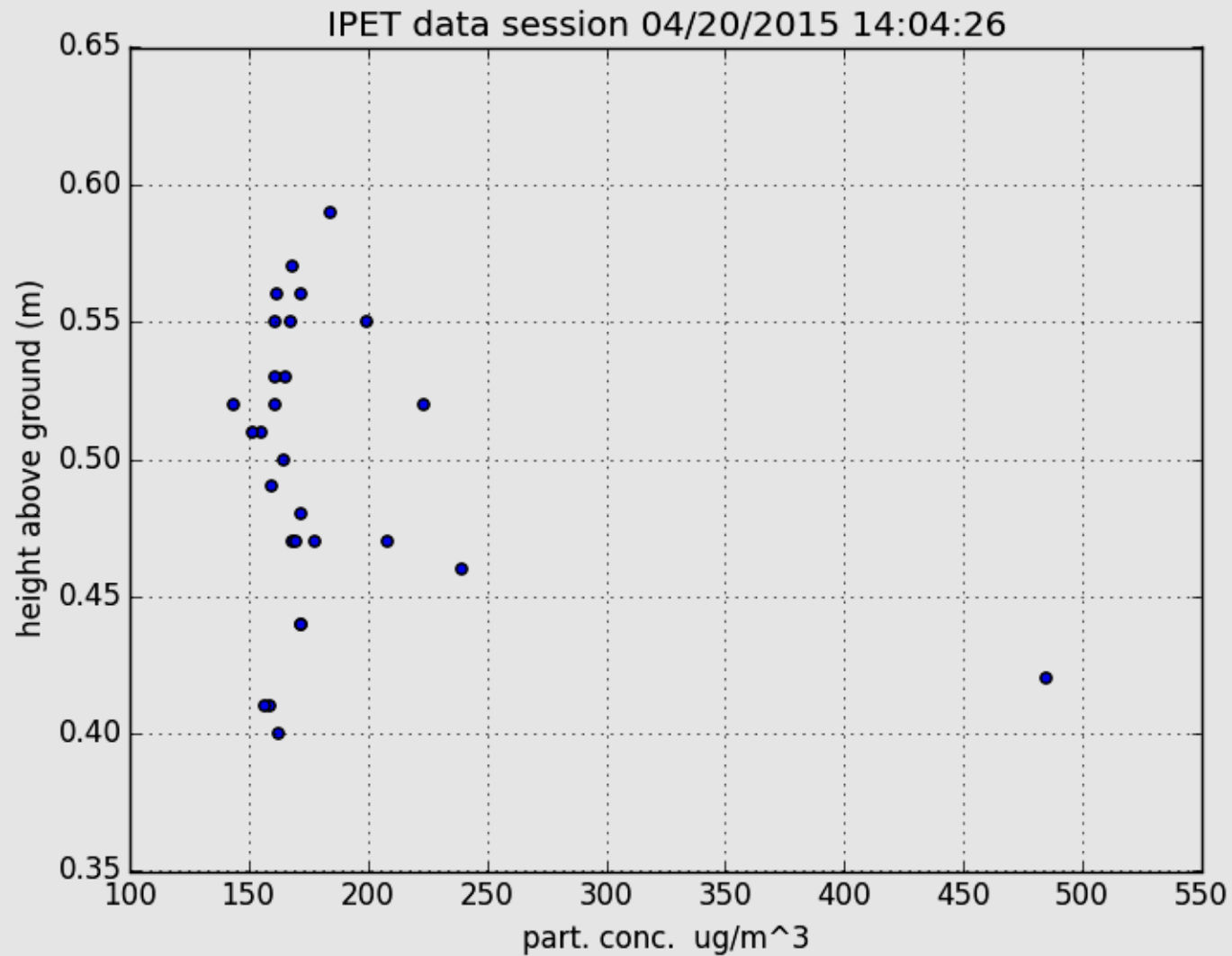
IPET data (Salts)



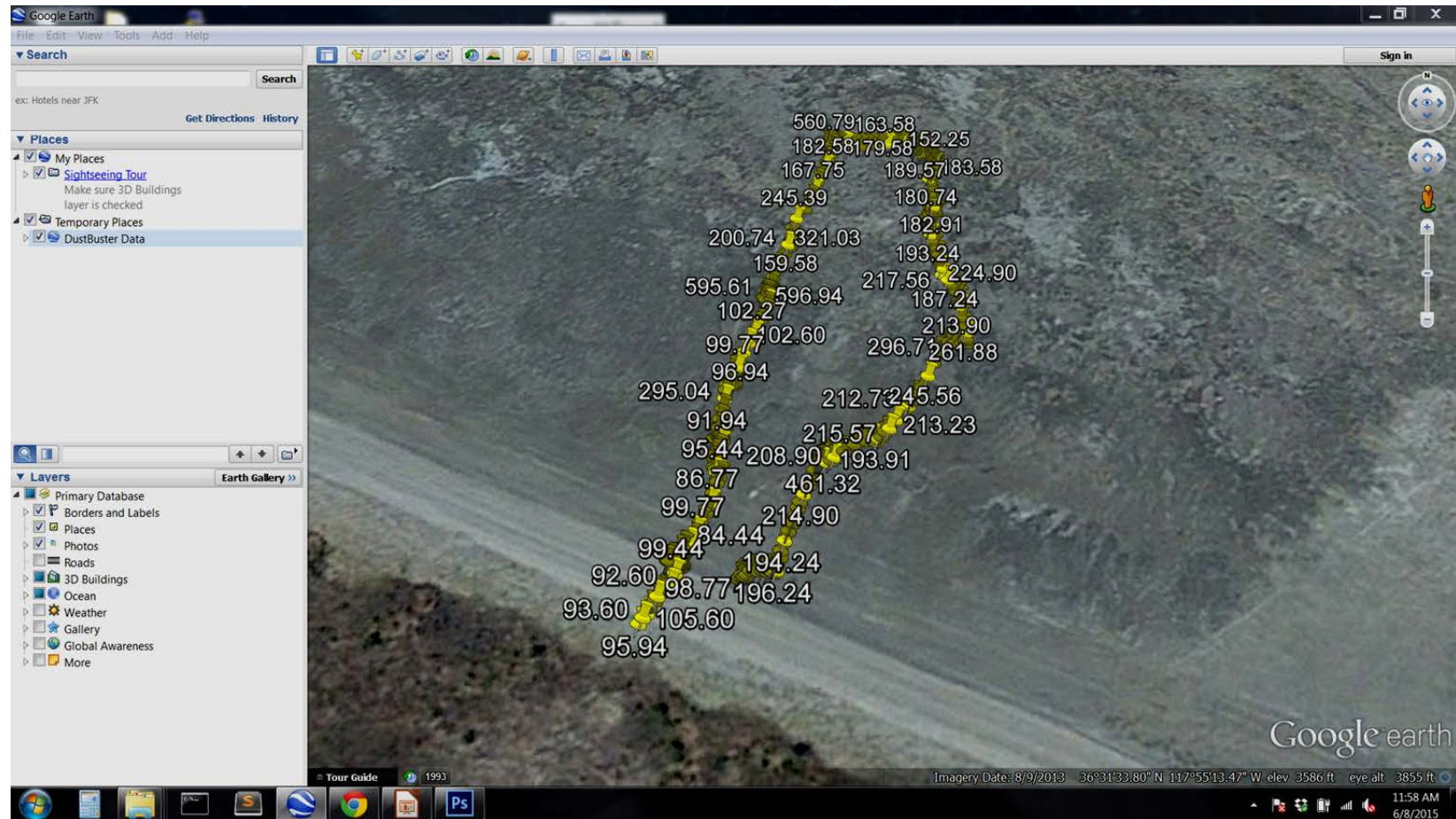
IPET data (A-Tower)



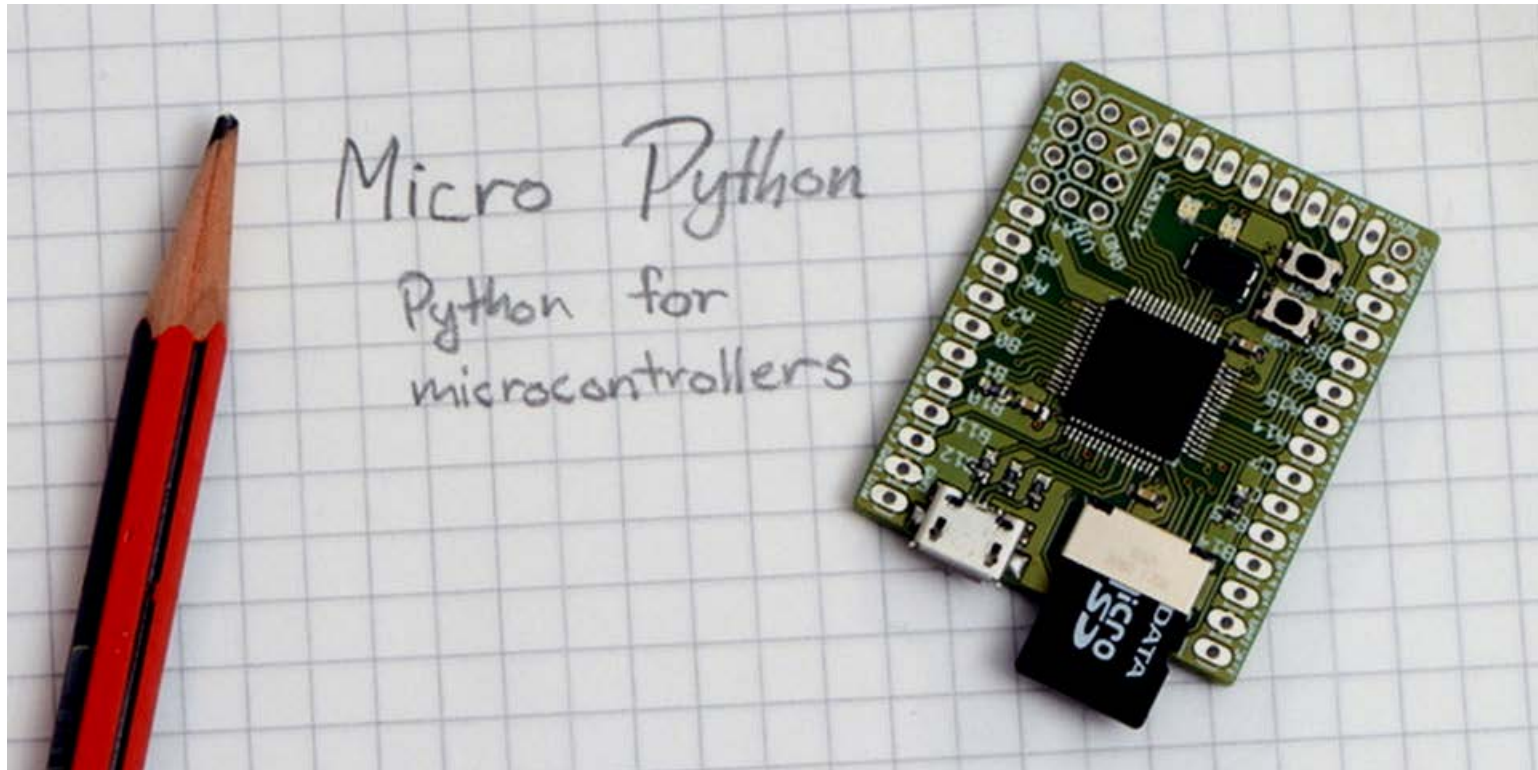
IPET data (A-Tower)



Google Earth Output Data



Even smaller?



Questions?

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Thank you!