

GAI A A20

OFF-GRID AIR QUALITY MONITORING STATION

Product Page: <https://aqicn.org/gaia/a20/>

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Version 1.6



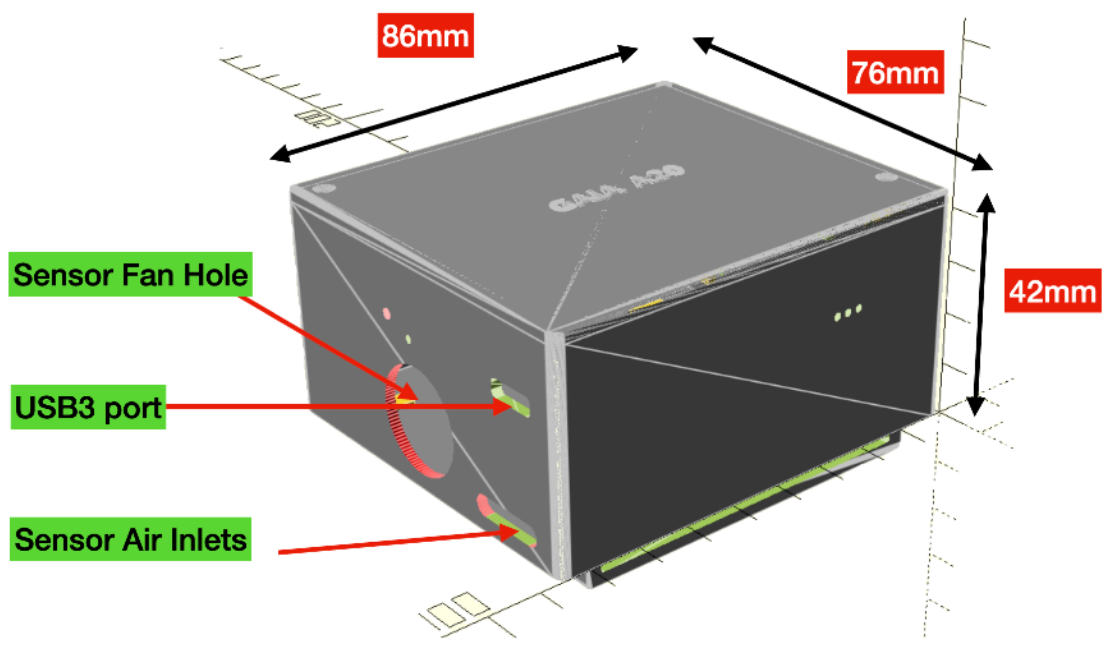
EXECUTIVE SUMMARY

Overview

The GAIA A20 is an off-grid Air Quality monitoring station with the requirements:

- Two redundant PM2.5 sensors (PMS 5003)
- GPS/Beidu GNSS + Integrated GPS Antenna
- Temperature and Humidity sensor (DHT11)
- Internal data storage, allowing up to 4 weeks continuous monitoring (with a duty cycle of 30 samples every 5 minutes).
- USB connection to retrieve the data storage
- No Wifi required (for autonomous monitoring)
- Battery powered - expect to run for at least 3 days without solar harvesting.
- Battery charging via Solar panel or USB connector, allowing forever off-grid operation, provided there are a few sunny day every week.
- Lightweight (can be hand-carried, for example attached to a handbag)
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The GAIA A20 dimensions is 86x76x42 mm sensor as shown below:



Side

Power Budget

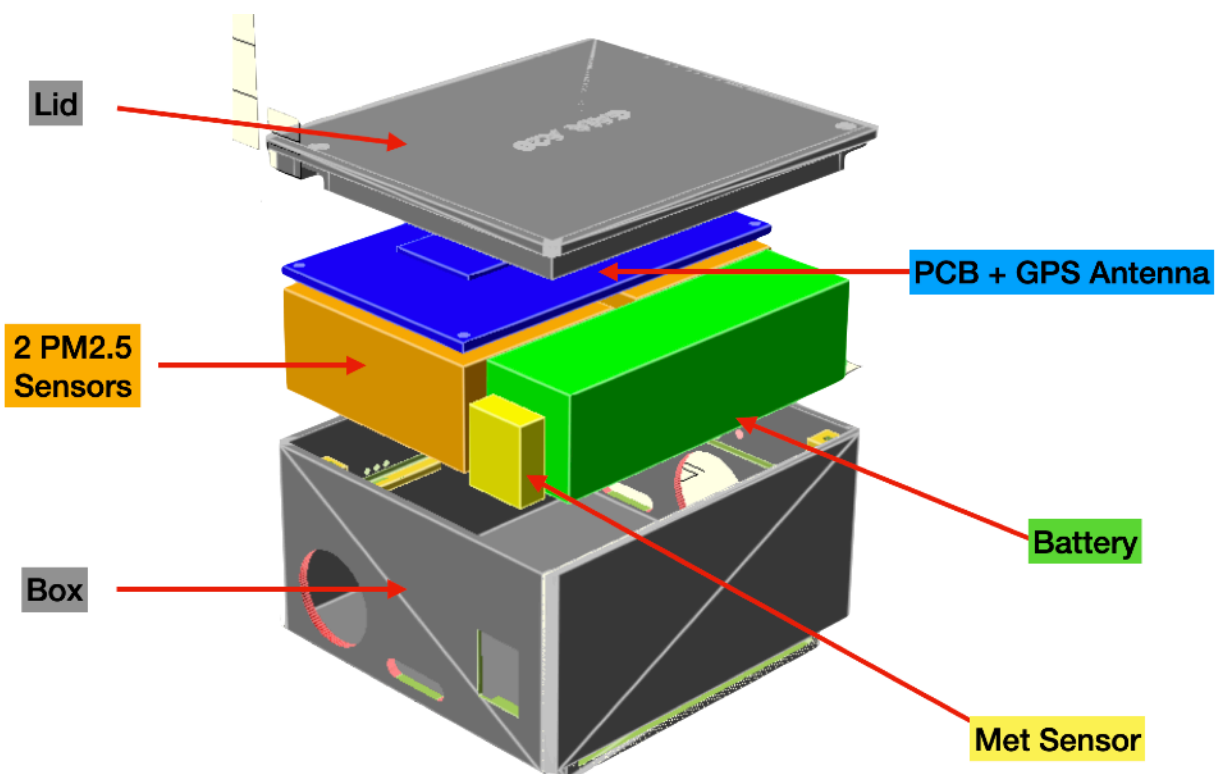
To be able to run on a battery, the sensor cannot run all the time and needs to be turned off from time to time. The proposed model runs the PM2.5 sensors alternately, for 30 seconds every 3 minutes, giving up to 300 PM2.5 samples per hour.

Sensor	Frequency	Duration	Power Consumption
PM2.5	3 minutes	30 seconds	100mW/h
GPS (full cycle)	30 minutes	60 second	2mW/h
Temp/Humidity	3 minutes	1 second	1mW/h
Main CPU	3 minutes	35 seconds	12mW/h

Assuming a total of ~120 mWh, using a 3400 mAh/3.7V battery gives a 5-day lifetime.

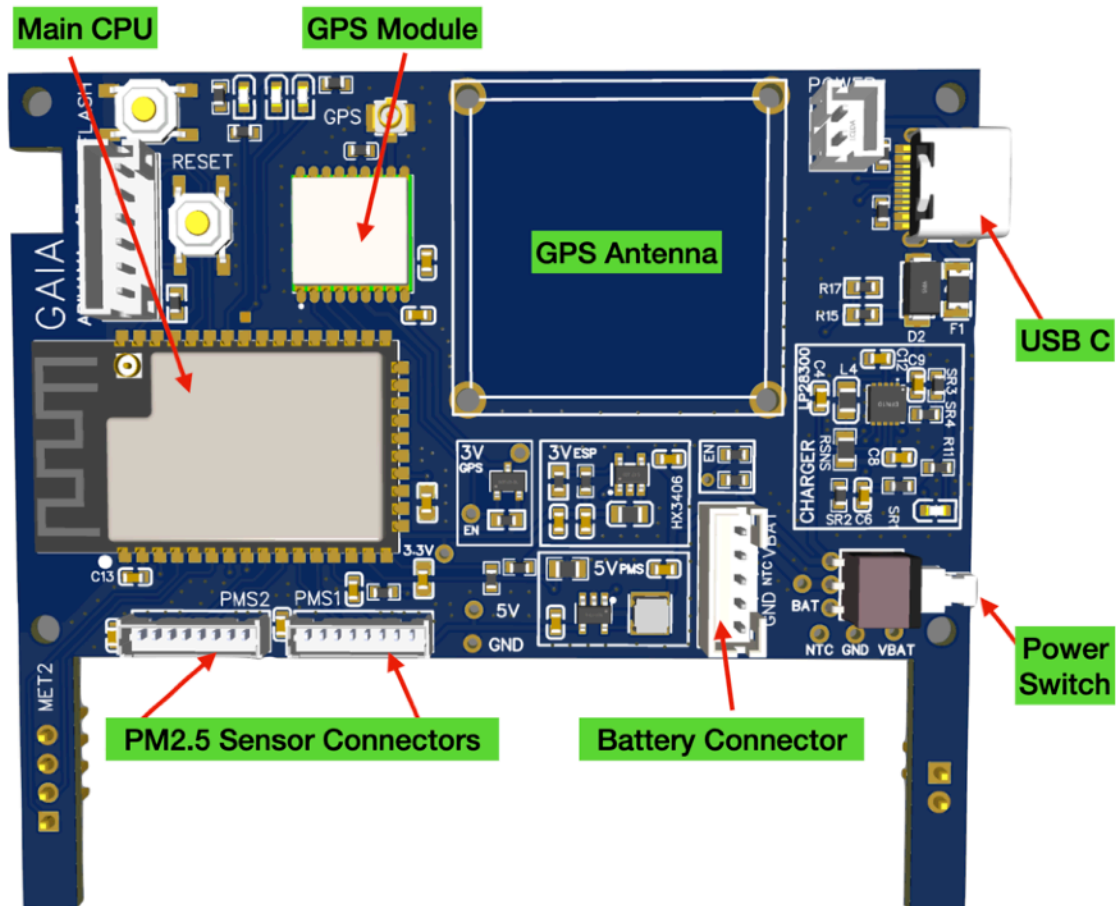
Mechanical Assembly

Internally, the 2 sensors are layered together with the battery. The PCB board with the GPS antenna is put on top of the PM sensors. The box lid can be closed by snap fitting (eg no need for screws).



Internal Electronic Design

The PCB consists of the main CPU (ESP32S2), a GNSS module (ATGM-336H) and discrete components for the power supply and charging.



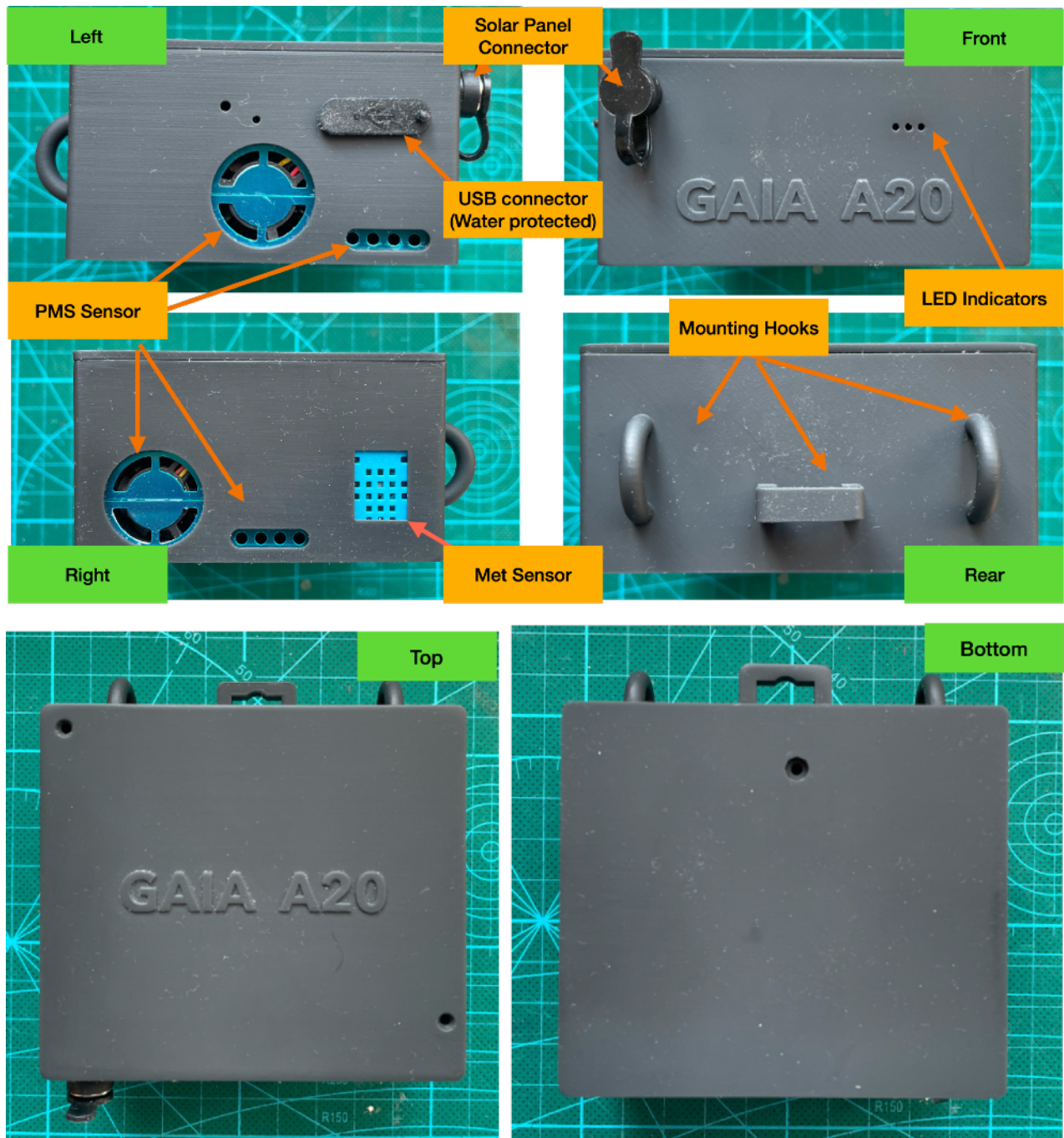
Other

The overall sensor weight is about ~180 grams, including sensor, enclosure and electronics, but excluding battery. With the battery, the weight is ~210 grams.

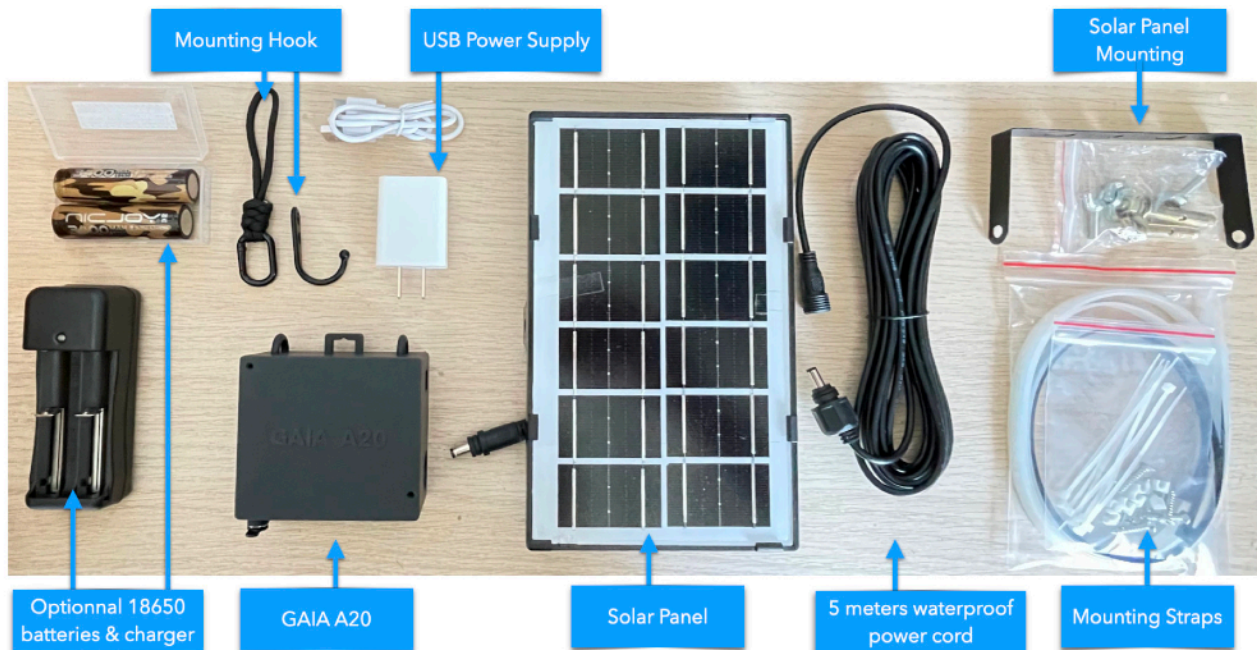
Mechanical Enclosure

The mechanical parts (shown in grey in the previous picture) are produced using Black SLA photosensitive resin.

- Material colour: black;
- material type: resin;
- surface: good finish;
- toughness: good toughness and high strength;
- heat distortion temperature: 58-69°C;



Package Content



Included in the package are:

- * 1 GAIA A20 station
- * USB Power supply
- * USB Data cabled (0.5 meters)
- * 2 Mouting hooks
- * Solar Panel (6V/1A, eg 6W)
- * Solar Panel Mouting mechanical parts
- * 5 meter waterproof power cable
- * General mounting tools (straps and screws)
- * Screw driver (for opening the A20 ststion and inserting the battery)

Optiinally included in the package are:

- * 18650 3400mA/h battery (allowing 5/7 days operation wihtout solar harvesting)
- * 18650 battery charger (with USB connector)

Solar Panel Mounting



Note that the Air Quality monitoring station mechanical enclosure is not water proof, so should be protected from rain and wind.

A 5 meters water proof power cable is provided with the solar panel, allowing to locate the station 5 meters away from the panel. If needed a 10 meters cable can be provided.

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