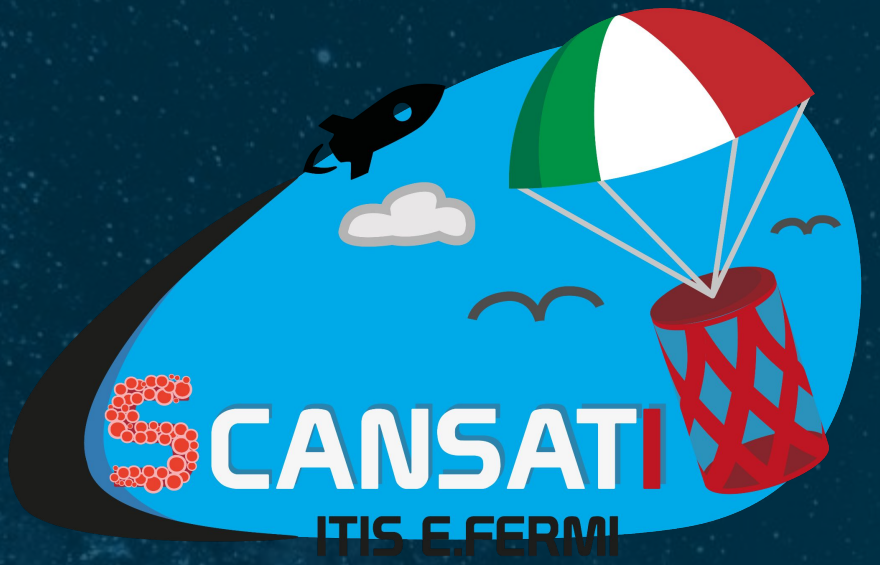

CanSat Project Presentation - sCANSATi team

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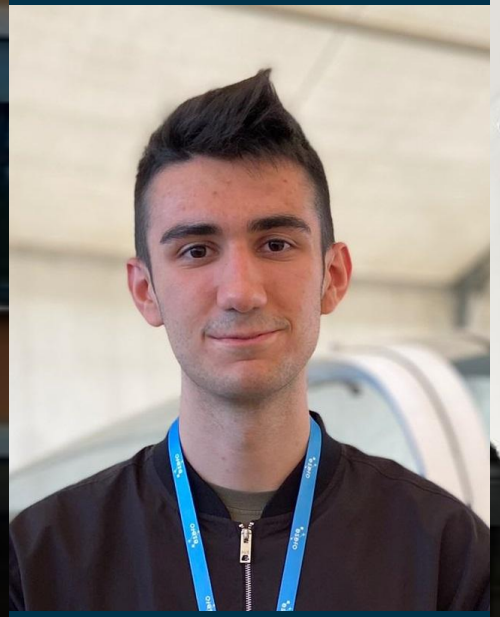
Our school and our team



Giulio Corradini

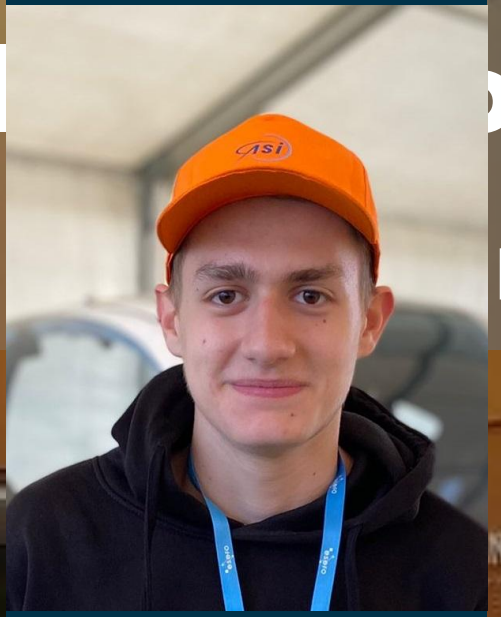
Software, radio communication

Francesco Mecatti

Software, radio communication

Giulio Gabbi

Bacteriological analysis



Andrea Bendin

Structural and electrical design

Marco Biolchini

Parachute design, assembler

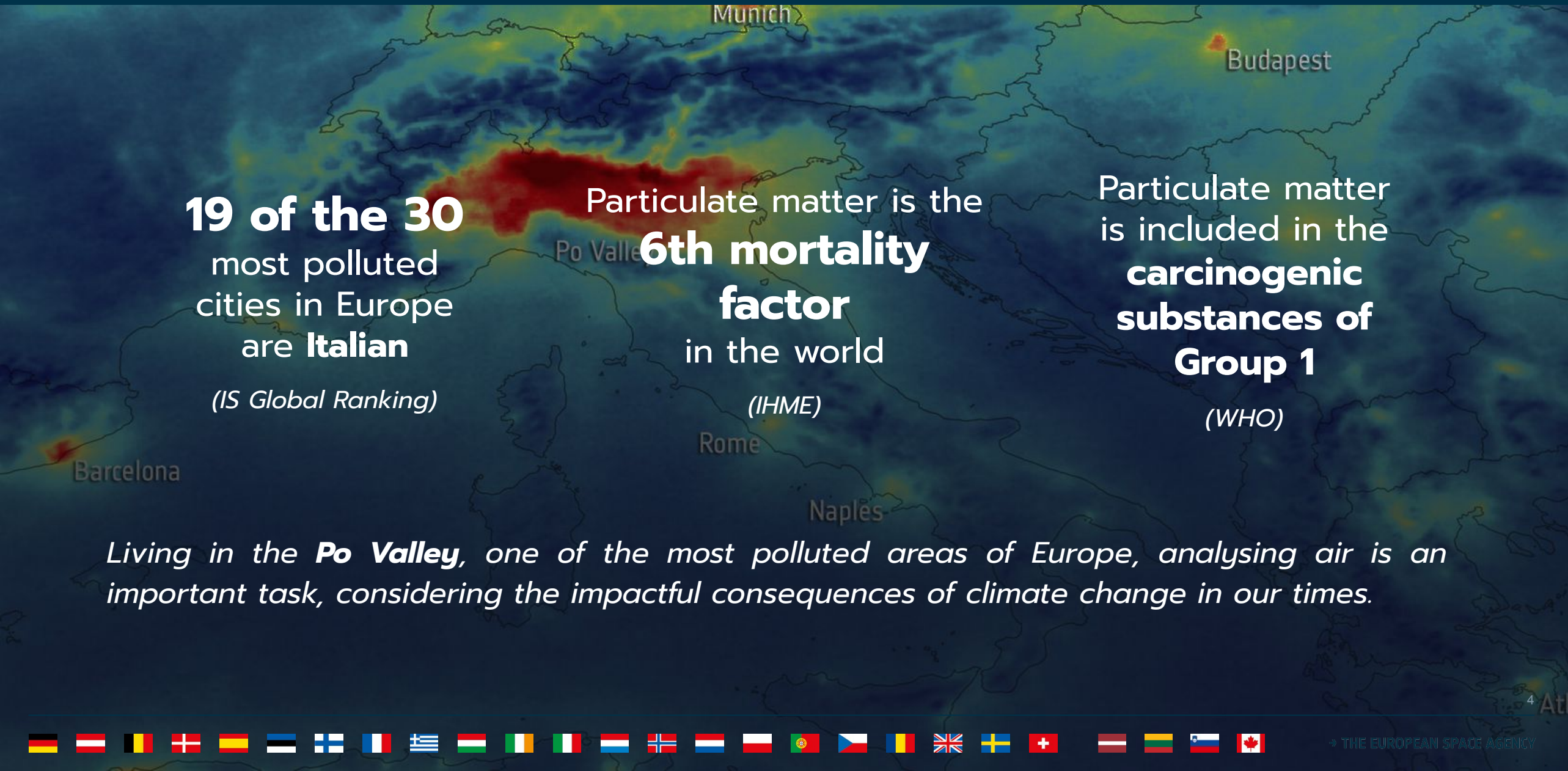
Overview of Missions

BACTERIOLOGICAL ANALYSIS

ADVANCED TELEMETRY

ADVANCED ENVIRONMENTAL ANALYSIS

Advanced environmental analysis



19 of the 30
most polluted cities in Europe are **Italian**

(IS Global Ranking)

Particulate matter is the **6th mortality factor** in the world

(IHME)

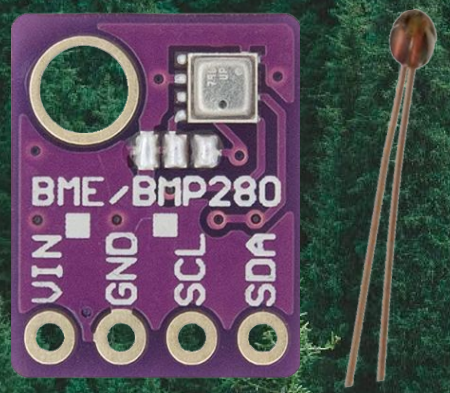
Particulate matter is included in the **carcinogenic substances of Group 1**

(WHO)

*Living in the **Po Valley**, one of the most polluted areas of Europe, analysing air is an important task, considering the impactful consequences of climate change in our times.*

Advanced environmental analysis

BME280 & NTC



- Temperature
- Pressure
- Humidity

Primary missions

SPS30

- PM Mass Concentration ($\mu g/m^3$)
- PM Number Concentration ($\#/cm^3$)

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Bacteriological analysis

Scientific studies have highlighted the dispersion of bacteria and viruses into the atmosphere and their transmission over long distances due to aerosol particles which are carried by the wind and in turn, spread bacteria.

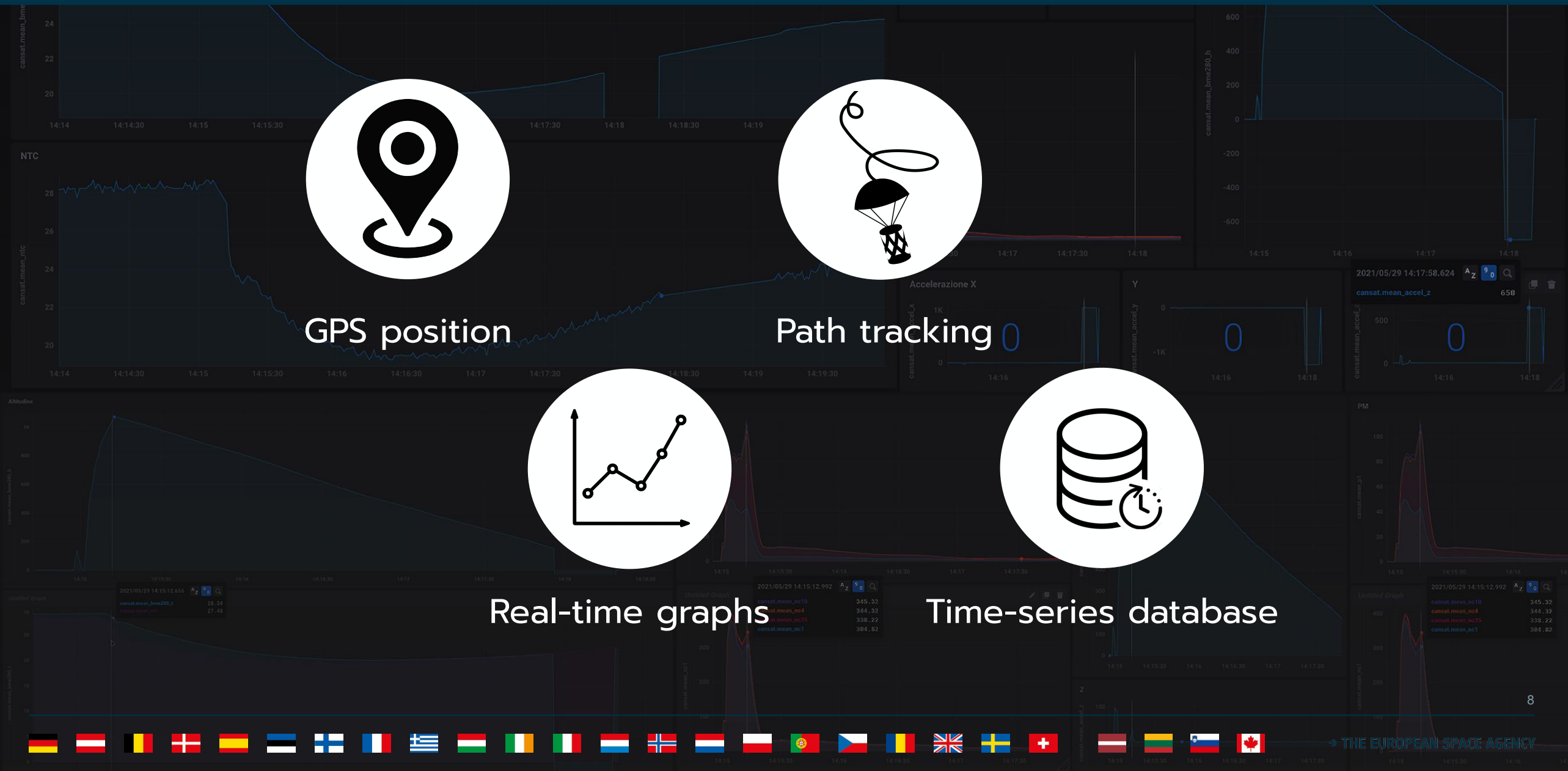
This decision was further discussed and eventually put into action as a result of the Covid-19 pandemic.

Bacteriological analysis

- **Launch**: the sterile non-woven gauze is inserted into the capsule
- **Immersion**: the gauze is soaked in 10 mL of deionized water in which it will release the collected bacteria
- **Petrifilm**: after 2 minutes 6 mL are aspirated with a sterile syringe, and then deposited on the culture medium of the Petrifilm

The removable compartment and the fan

Advanced telemetry



GPS position

Path tracking

Real-time graphs

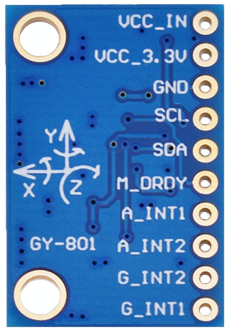
Time-series database

» THE EUROPEAN SPACE AGENCY

Advanced telemetry

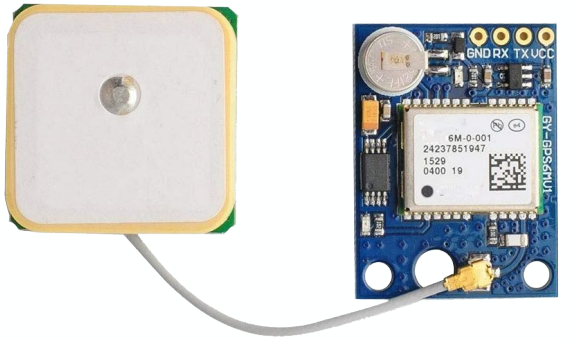
LOCALIZATION AND PATH TRACKING

GY-801



- Gyroscope
- Accelerometer
- Compass

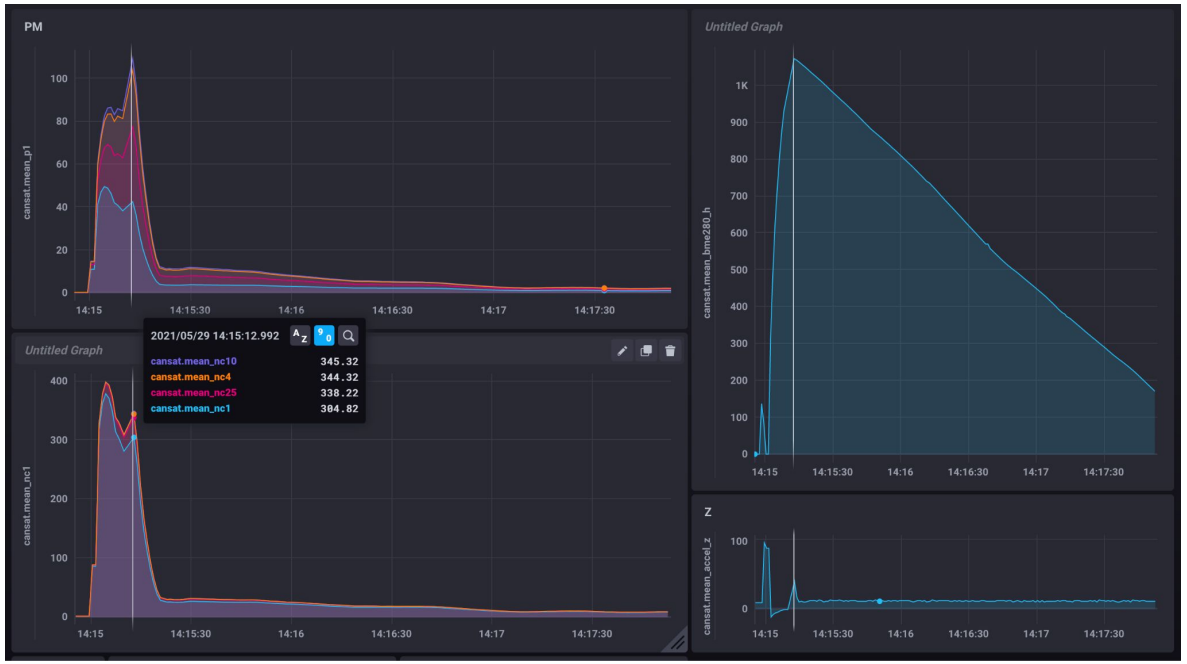
UBLOX NEO 6M



- GPS

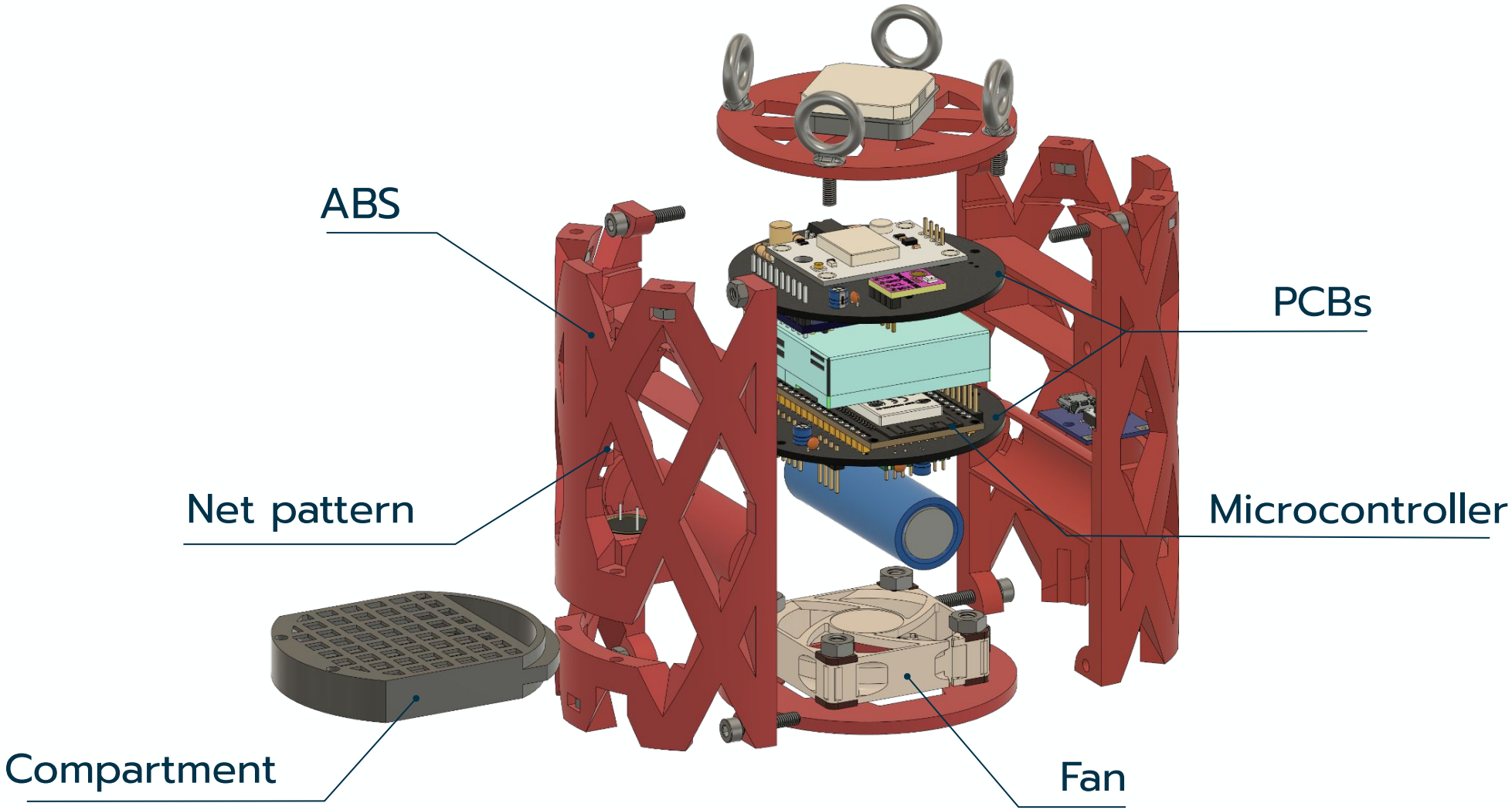
Advanced telemetry

REAL-TIME GRAPHS



Chronograf dashboard

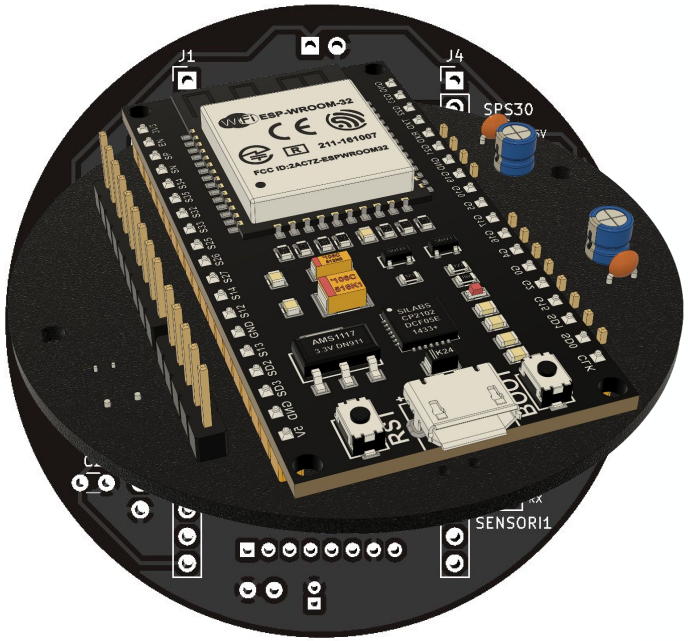
Structural design

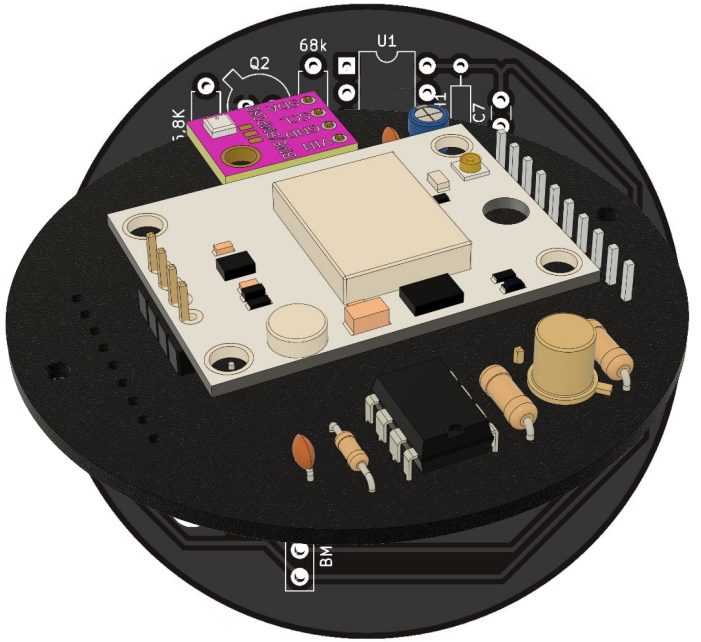


Electronic design

3D Top view

Main Board





Sensor Board

Software stack

Code	Main program	
Peripherals interfacing	Custom libs	Official libs
Kernel	FreeRTOS	
ESP-IDF	Driver	HAL
Hardware	ESP32	

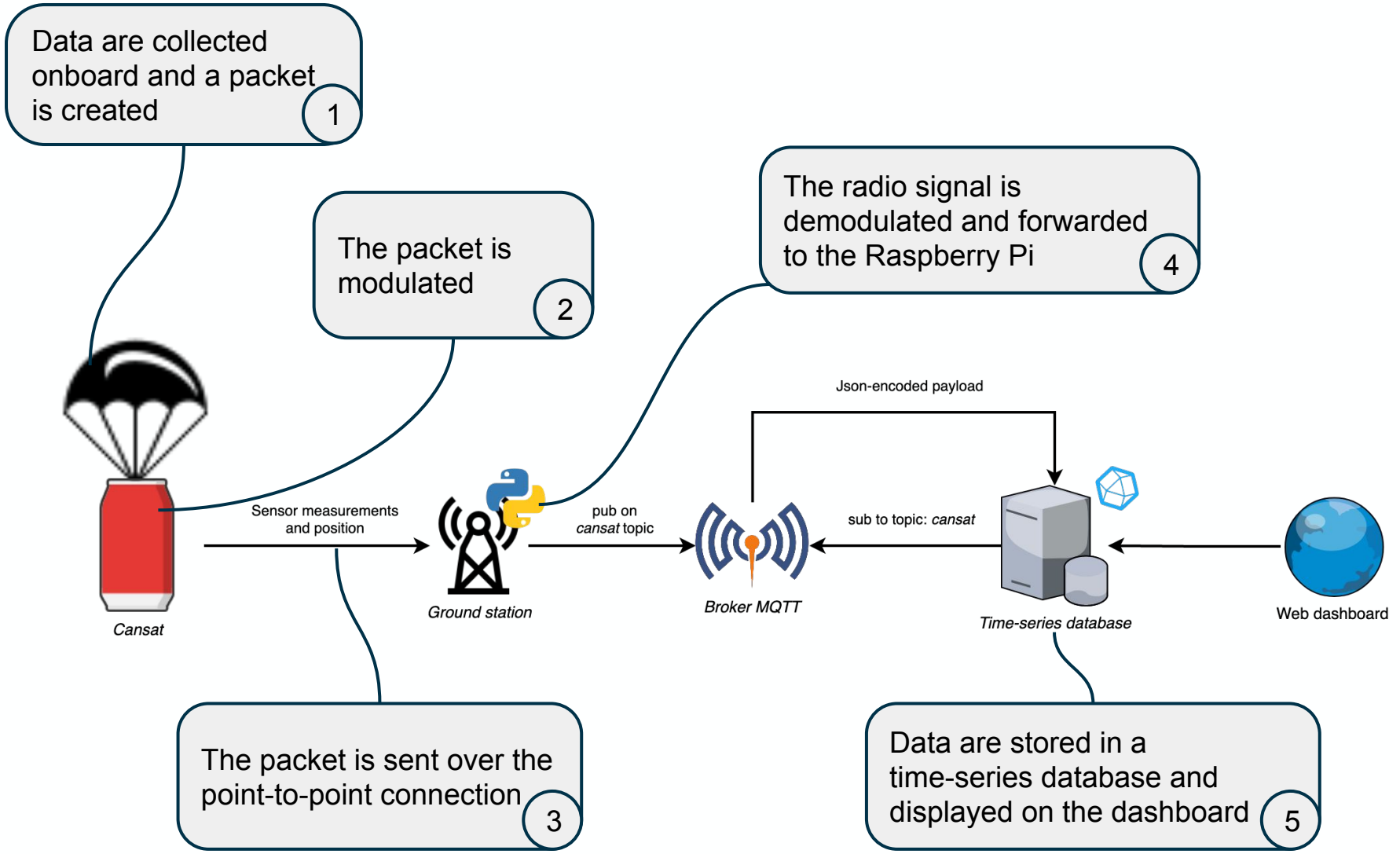
CanSat onboard firmware

built on top of both vendor and custom libraries, with focus on fault tolerance by design

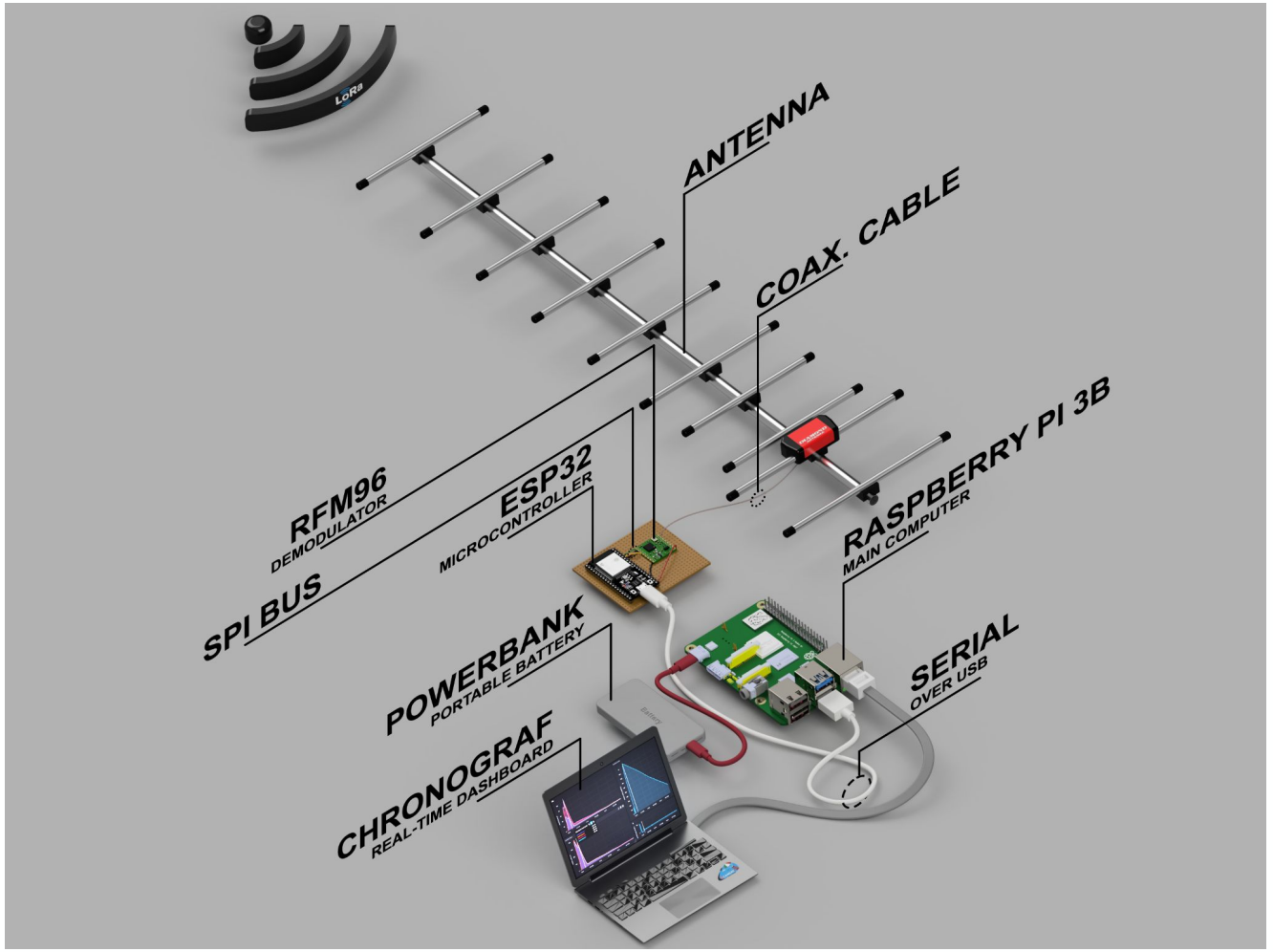
Communication system

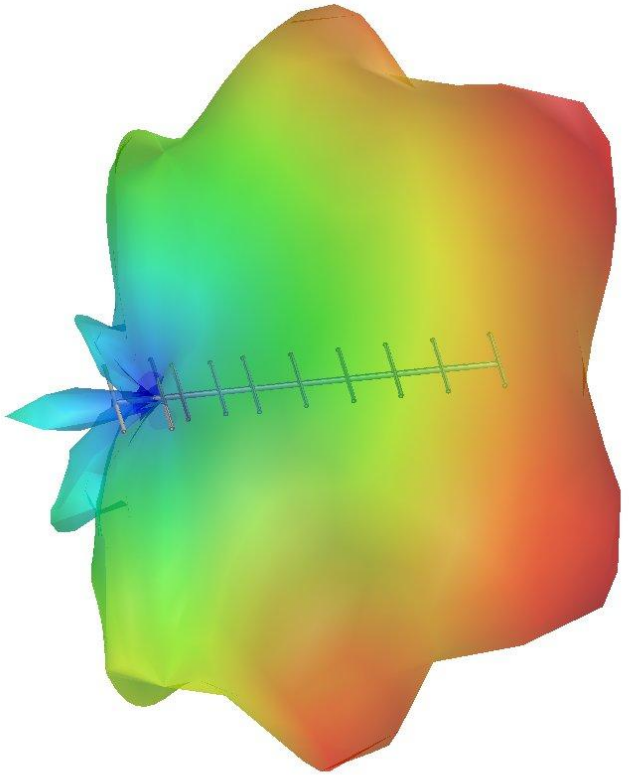
LoRa

- **Long Range**
- **Low Power**
- **High sensitivity**
- **Spread spectrum modulation**
- **Noise resistance**



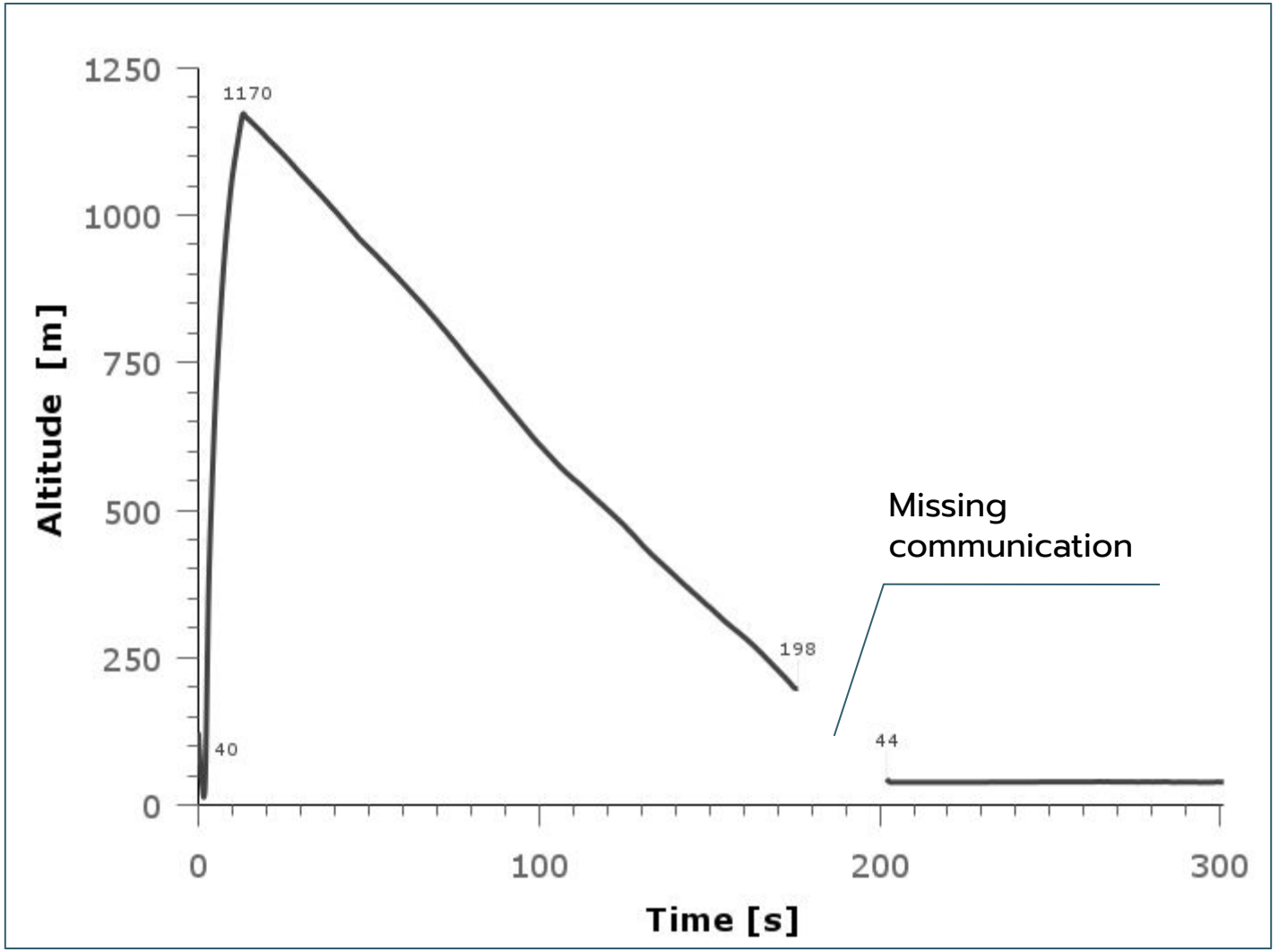
Ground station



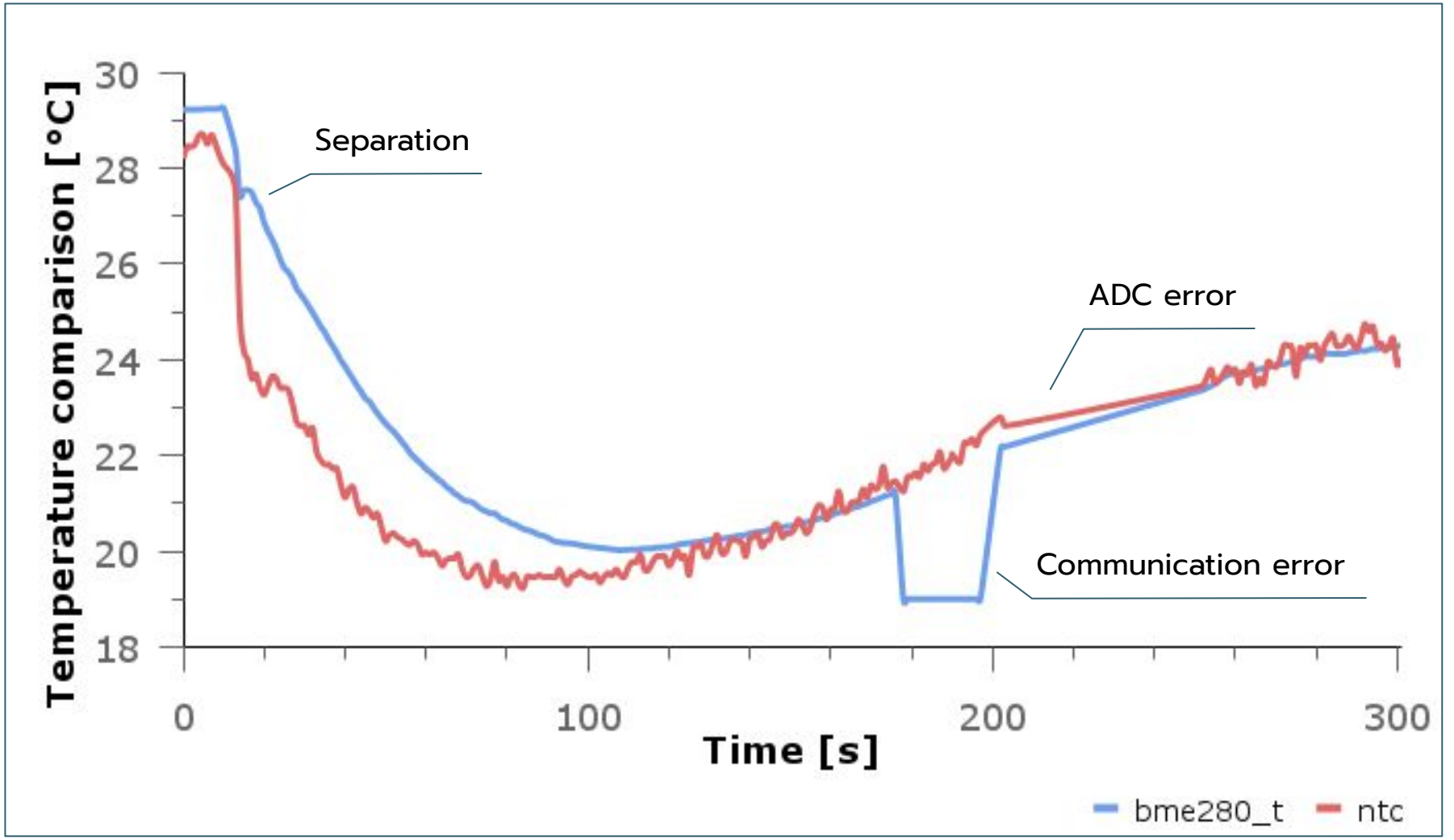


3D simulation of the antenna radiation pattern

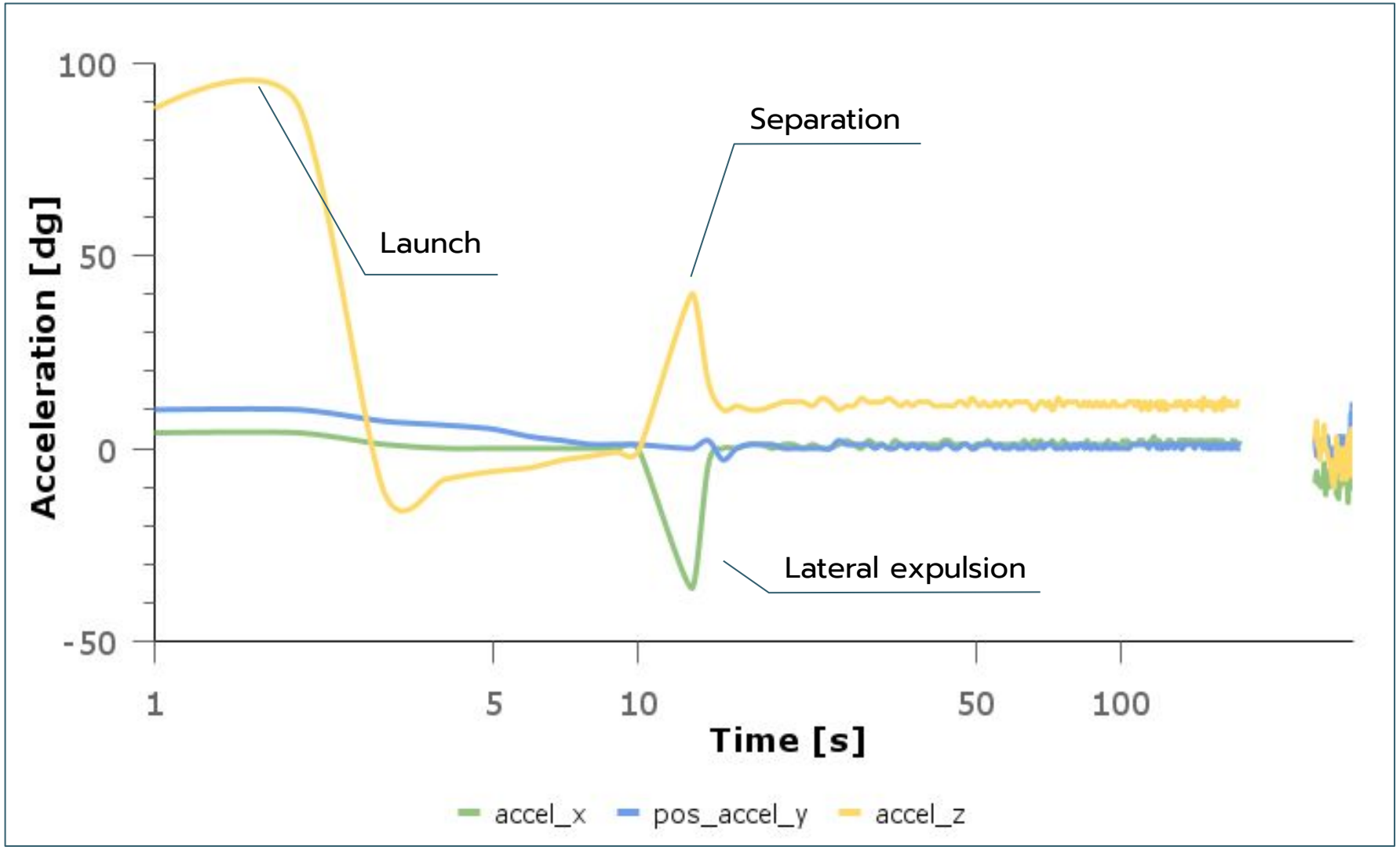
Scientific results



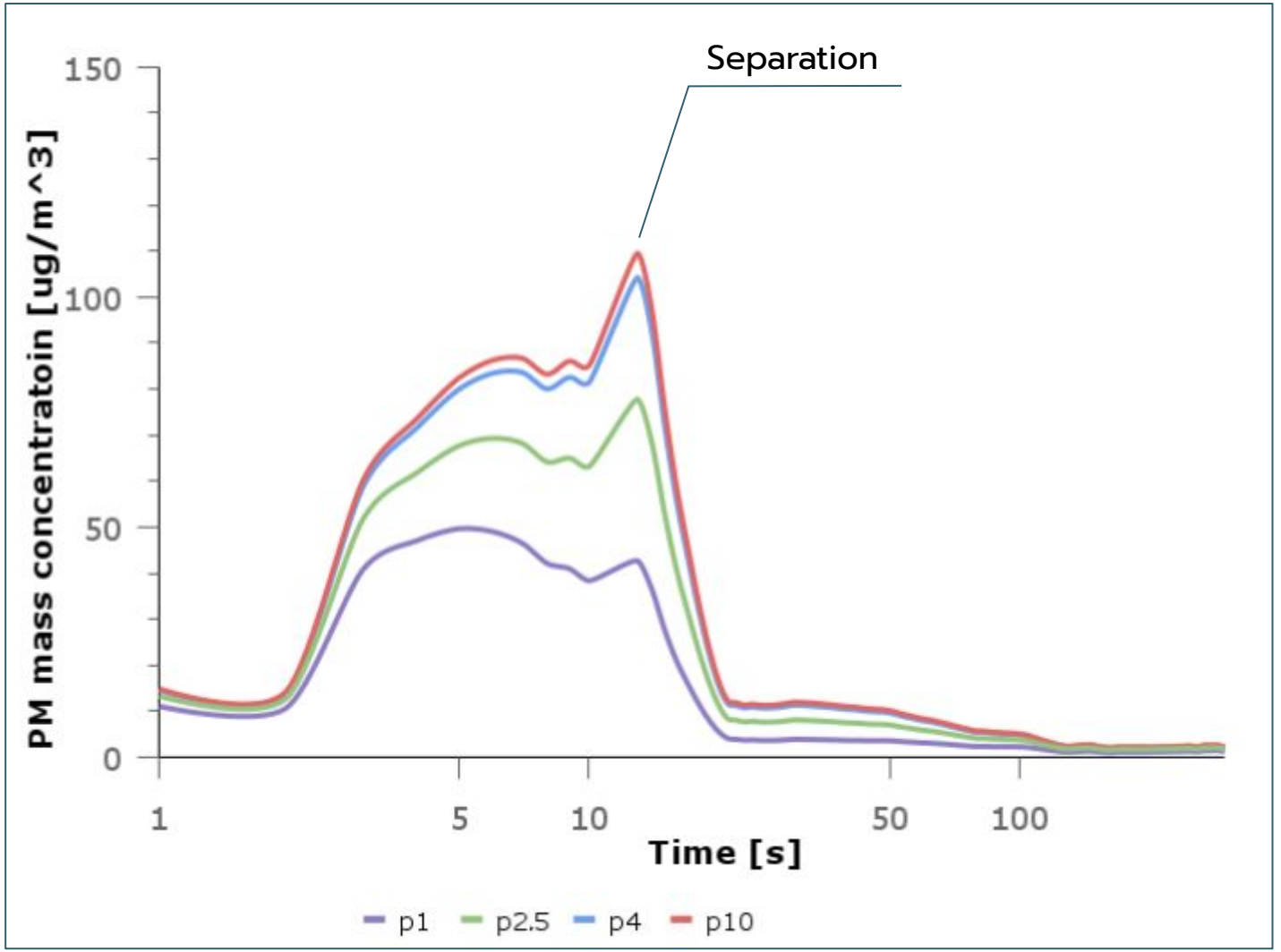
Scientific results



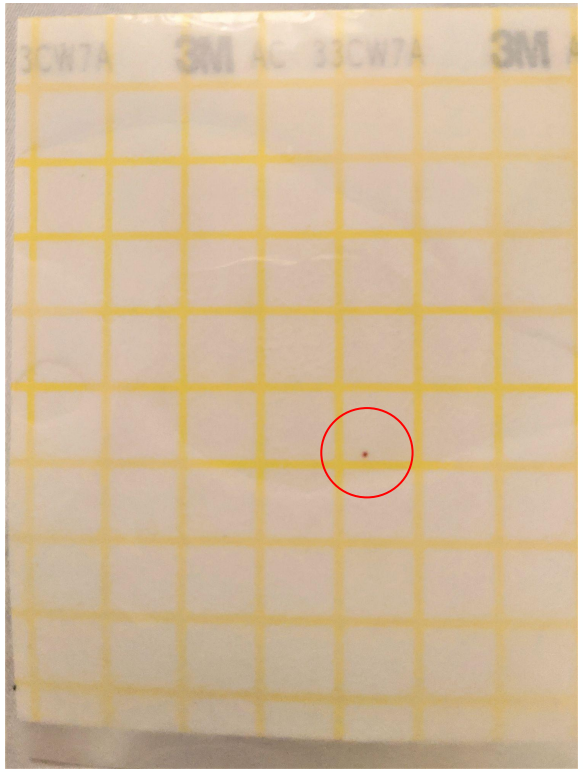
Scientific results



Scientific results



Scientific results



The morning following the launch it was possible to notice the formation of a ***bacterial colony*** *(1 red dot).*

The result is acceptable: the flight time (3 min) is quite short, as is the presence of bacteria in the air.

Requirements

Characteristics	Figure (units)
Height of the CanSat	115 mm
Mass of the CanSat	300.3 g
Diameter of the CanSat	65 mm
Additional length of external elements (along axial dimension)	70 mm
Flight time scheduled	158 - 182 s
Calculated descent rate	5.48 - 6.32 m/s
Radio frequency communication	433 MHz
Power consumption	0.9214 W (max)
Can cost	€ 281.17
Total cost	€ 467.27

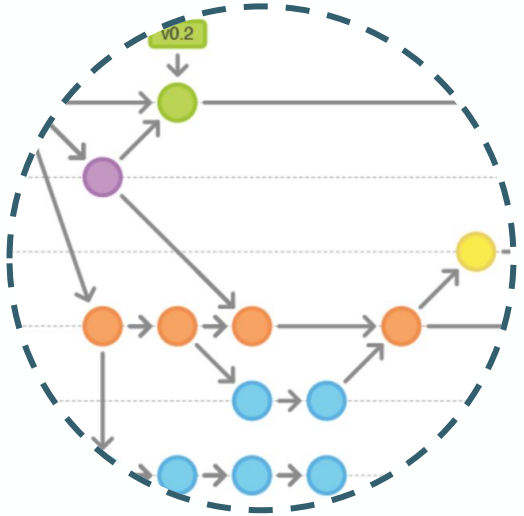
Effective dimensions of the CanSat

Outreach

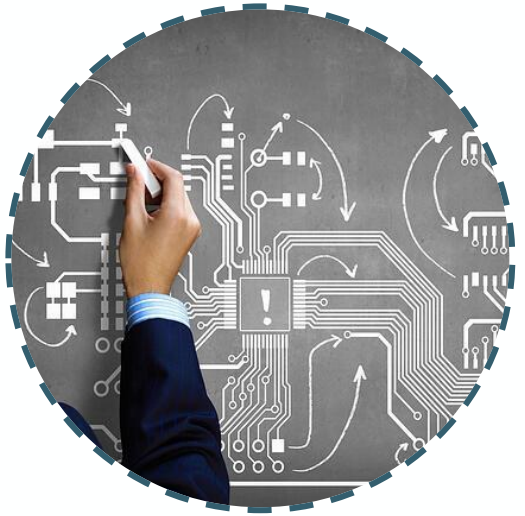
AD MODUM R&D
Home > News > Not only business ...
NOT ONLY BUSINESS
sCANSATi
E.Fermi
MO
We are particularly focused and proud to sp
we promoted a brainstorming with the team
Institute in Modena, for the identification of
pathogenic microorganisms in the atmosph
bacteria collected during the flight on the C
The sCANSATi team won the Italian compet
Enrico Fermi – Istituto Tecnico Industriale –
CanSat
ESA CanSat
31 maggio 1:27 PM
complimenti ai nostri ferr
vincitori dell'ESA CanS
Italia 2021!
YouTube IT
Cerca
STRUCTURAL
OVERVIEW
sCANSATi
ITIS E.FERMI
https://youtu.be/T7g9FIWCnoQ
Cansat
Modena I ragazzi del Fermi a tu
per tu con le aziende
Ministero dell'Istruzione
Ministero dell'Università e della Ricerca
Accedi
Enrico Fermi
Istituto Tecnico Industriale
Privacy
Contatti
tra squadra
TIS "E. Fermi", Modena
la finalissima
vato secondo
tre tre
no dovuto
rinunciare per le difficoltà nel terminare il lavoro a causa del Covid.
GAZZETTA DI MODENA

Conclusion

Gained skills and learned lessons



Code versioning and fault tolerant software



Reliable electronics and radio designs

Teamwork with clear division of roles

Ideas sharing and effective communication

Thank you for your attention!