SIMBA

Measuring the Earth's Radiation (Im)balance

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Absolute Radiometry
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Solar-Terrestrial Centre of Excellence (STCE)
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Sun-Climate Symposium, Tuscon, AZ
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Outline

RMIB, Laboratory for Absolute Radiometry

Who are we?

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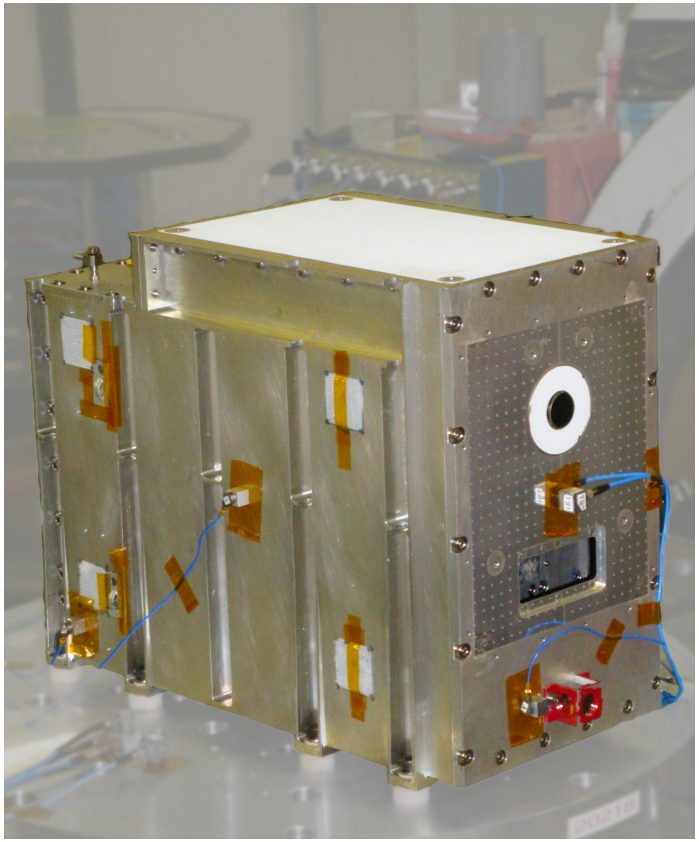


SovaP radiometer during PICARD integration

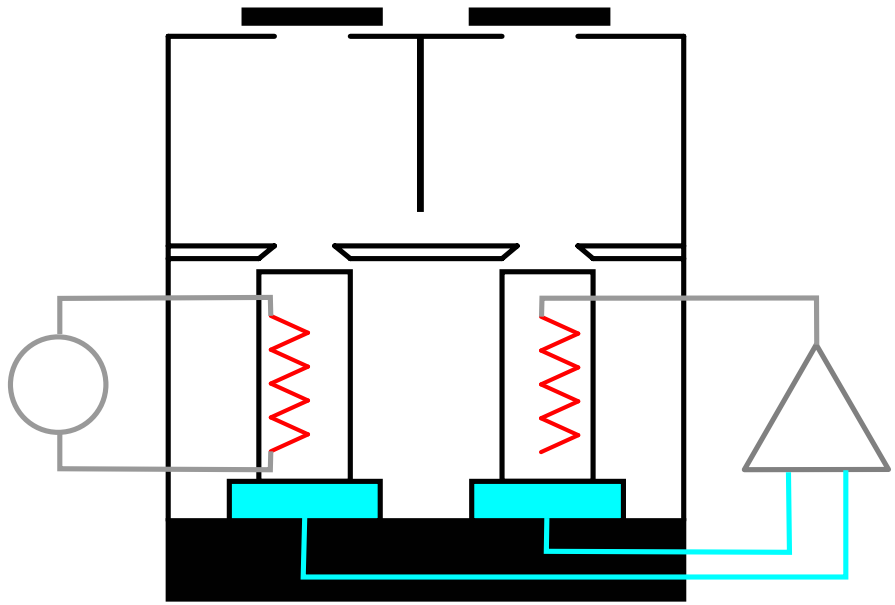
Pyrheliometer Comparison in Davos, CH

Absolute Radiometry

Who are we?

Schematic principle of a Differential Absolute Radiometer (DIARAD)

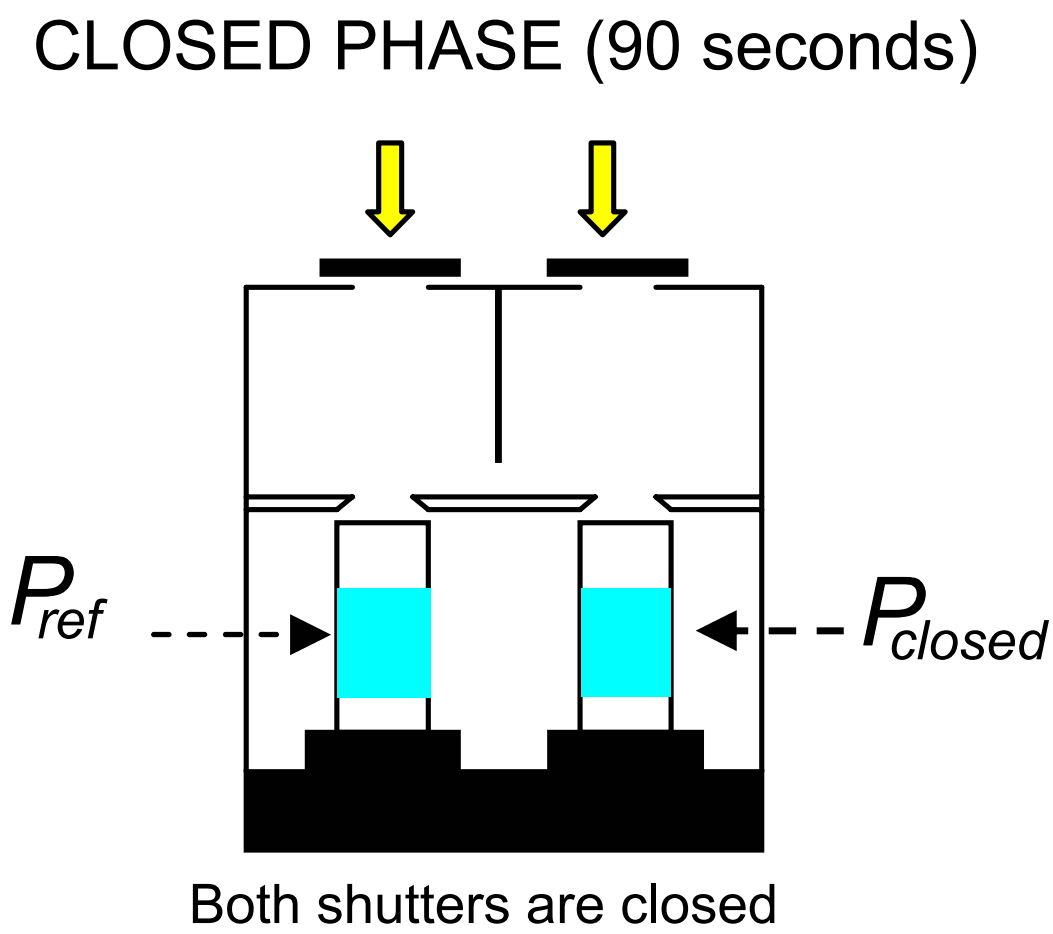
Cavities, Heaters and Flux Sensors



Absolute Radiometry

Who are we?

Schematic principle of a Differential Absolute Radiometer (DIARAD)



Absolute Radiometry

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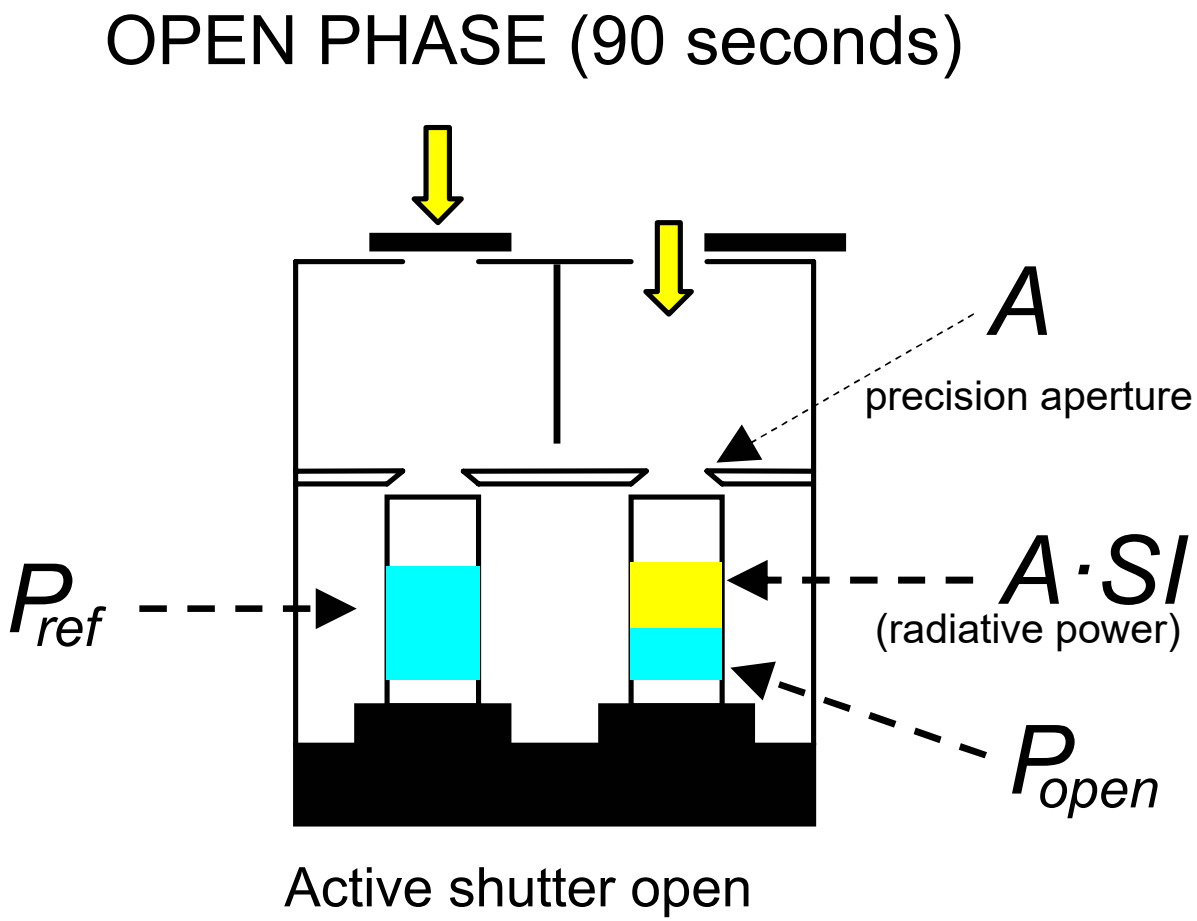
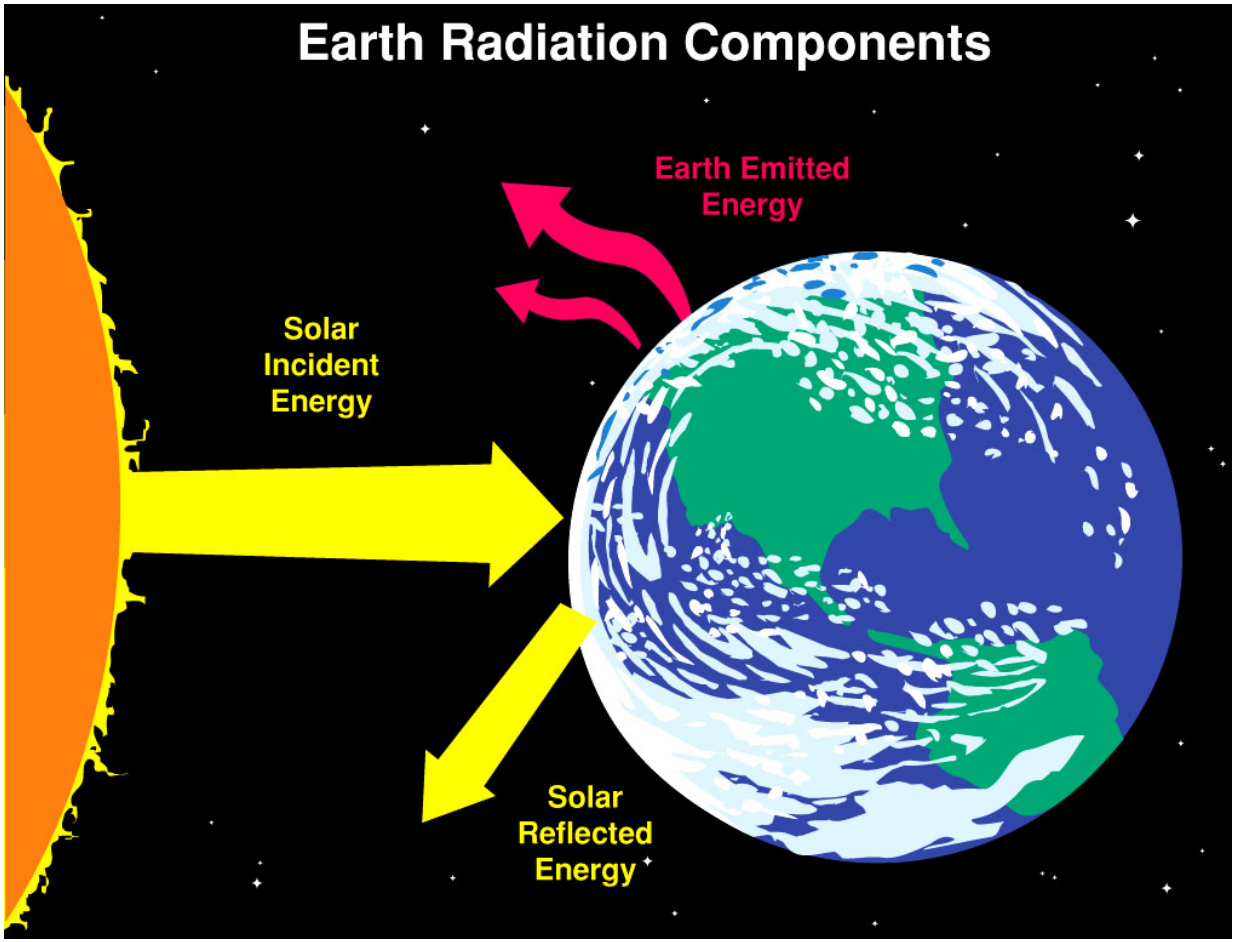


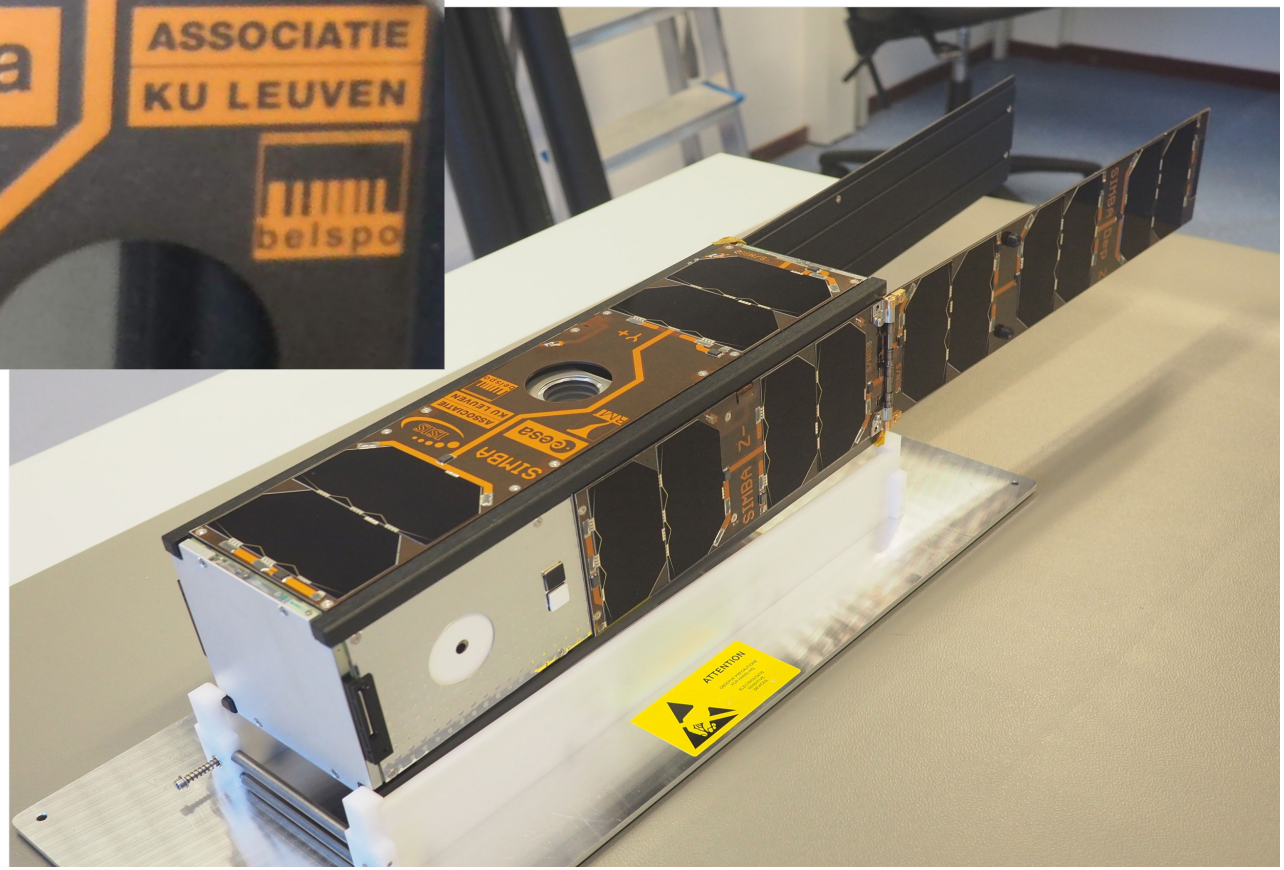
SIMBA satellite

The goals of the SIMBA mission



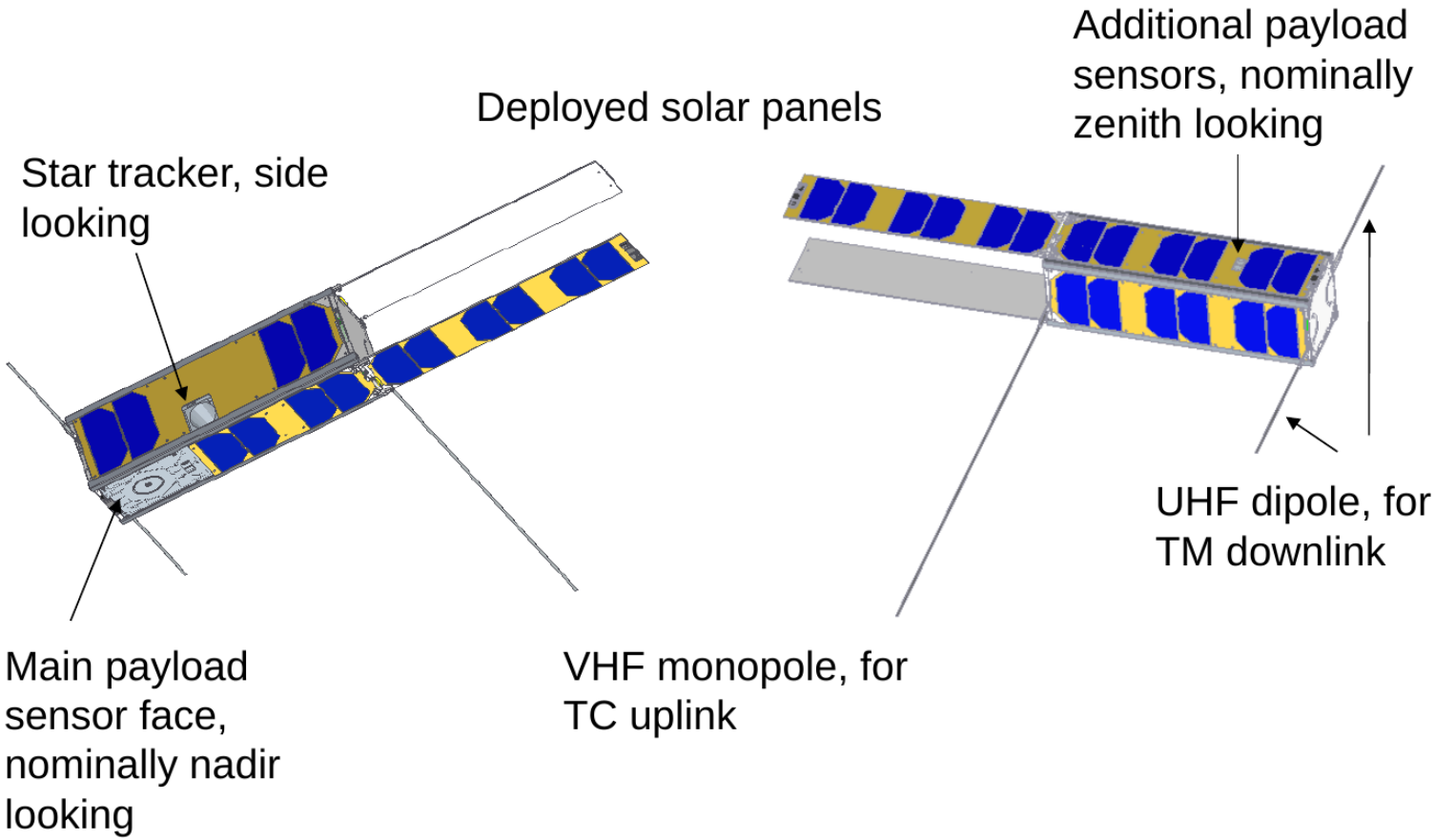
Partners of the Mission

The goals of the SIMBA mission



Satellite and Bus

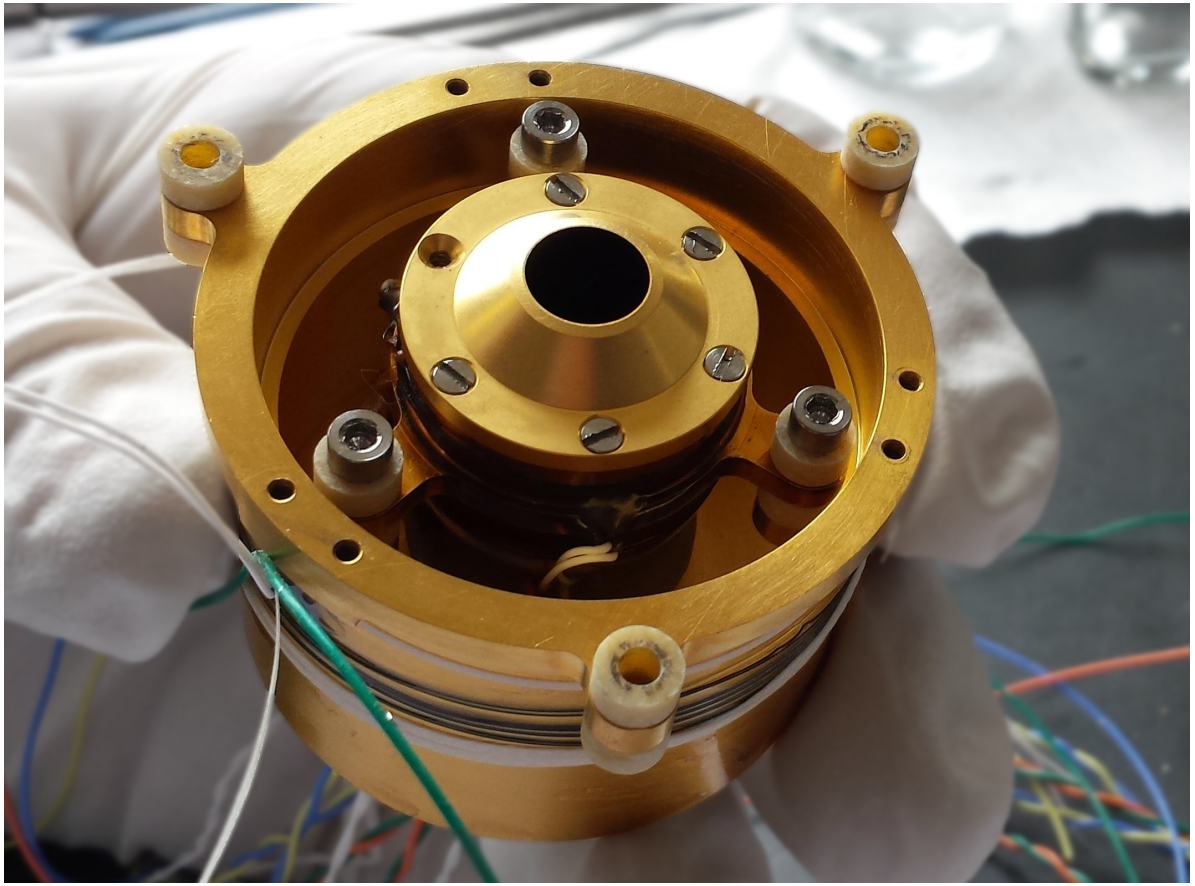
Design



- 3U, 4 kg, 3.5 W, 0.6 MB/day
- Payload and lead: RMIB, ADCS: KUL, Bus: ISIS

Cavity sensors

Payload bay and sensors array

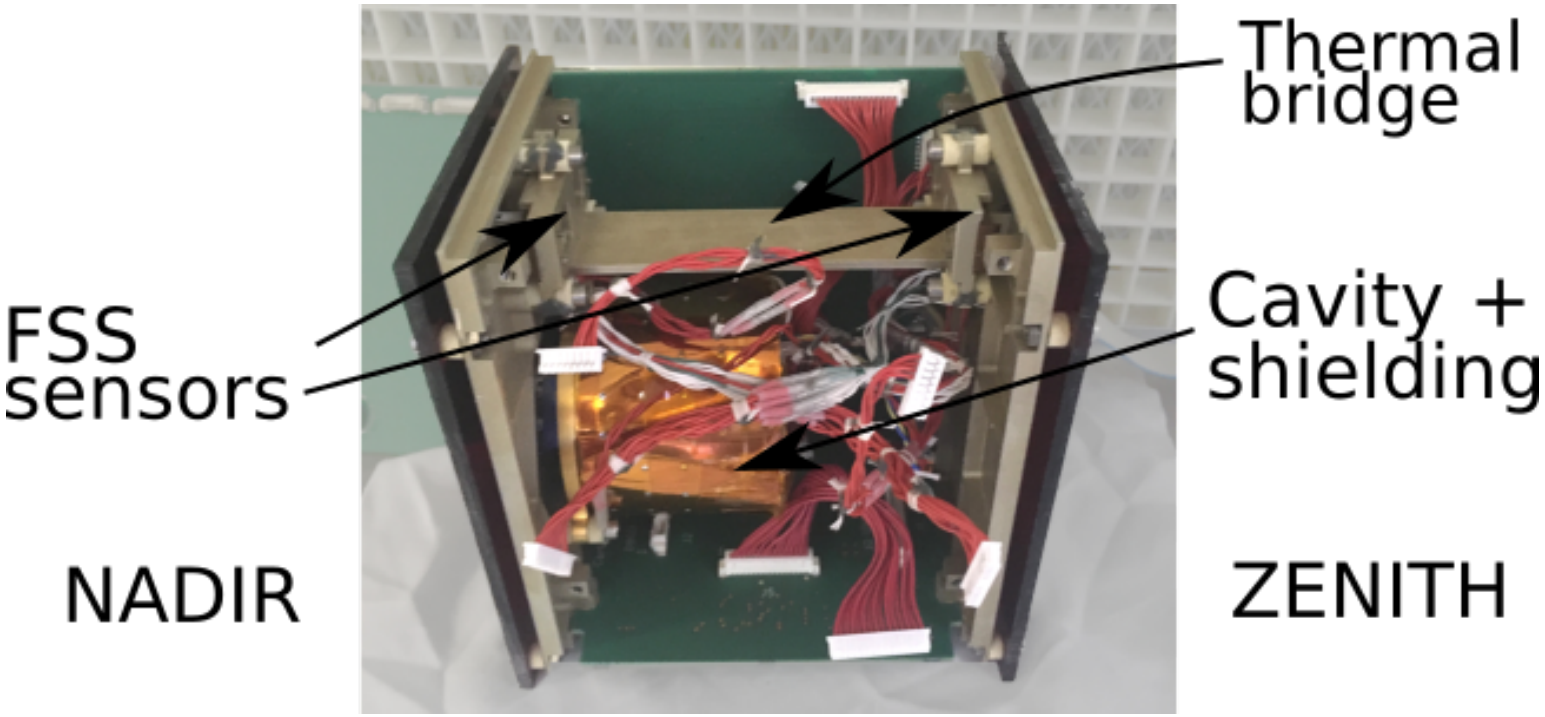


Flat Spetrum Sensors

Payload bay and sensors array

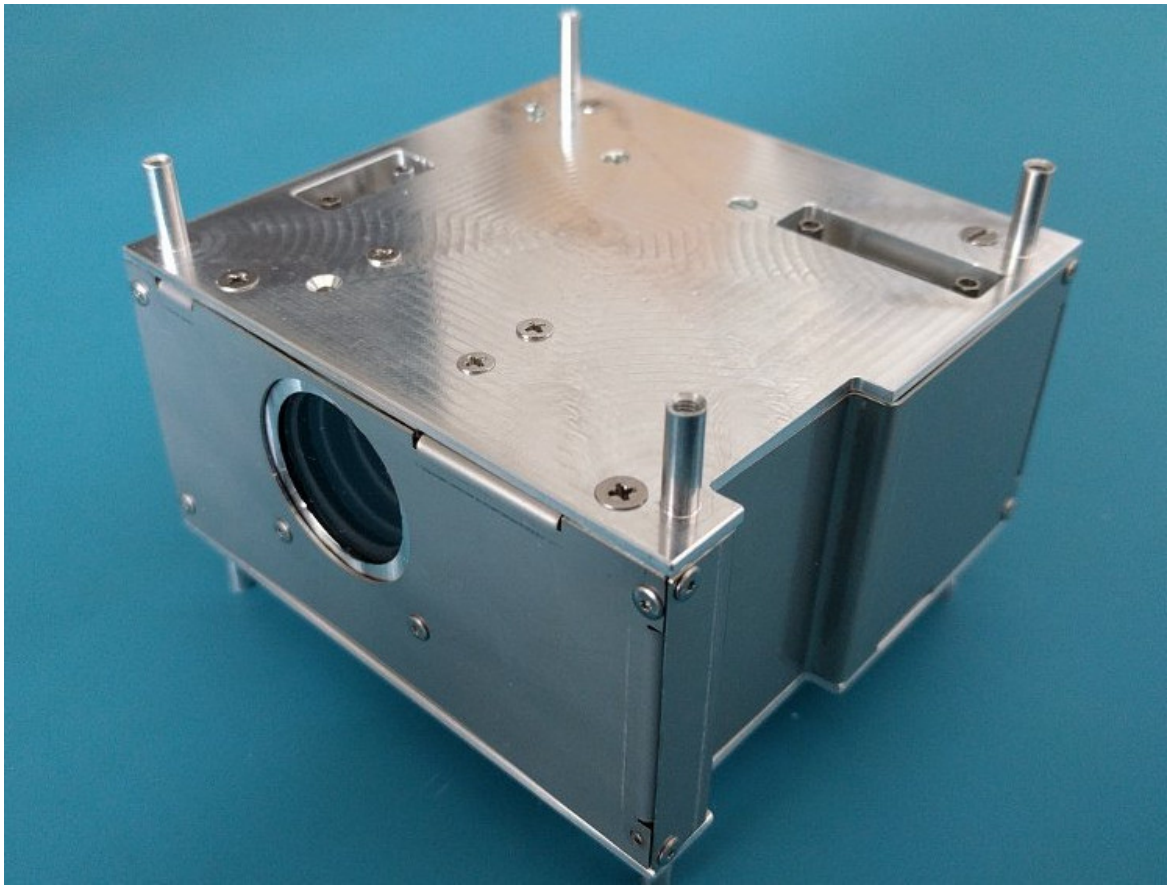
Payload bay integration

Payload bay and sensors array



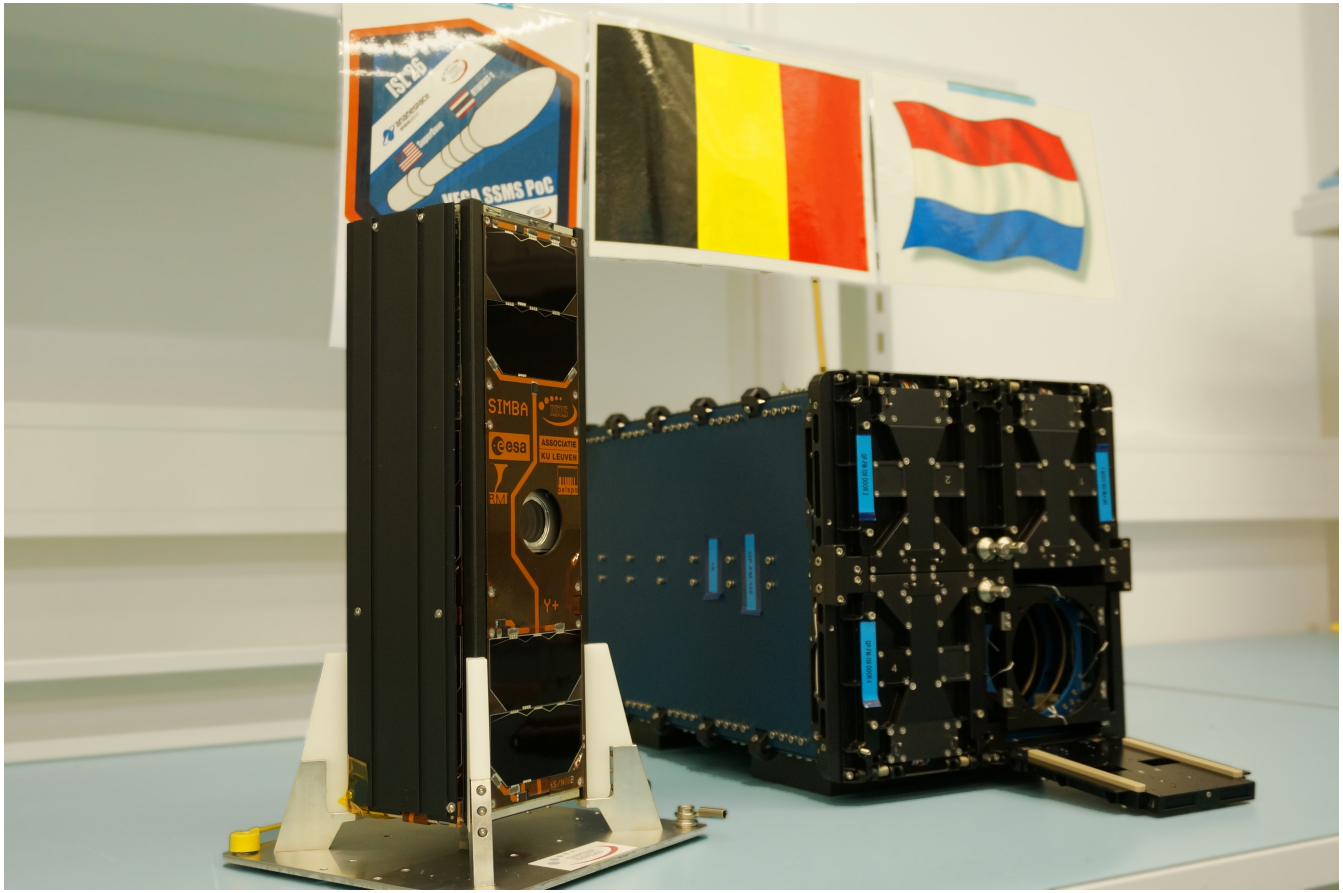
Attitude Detection and Control System

Payload bay and sensors array



Star tracker + inertial gyroscopes. $\delta\sphericalangle \approx 0.1$

Mission's current status



Ready for vehicle integration, shall be lauched by Vega VV-16 in March 2020 (Delayed after Vega VV-15 failure)

Challenges

Thorny branches

Enormous overhead compared to just piggyback on a (big) satellite

- Payload is main contractor for the whole (albeit small) satellite
- Think about legal aspects to operate
- Cubesats limitations
- Micro electronic integration
- Radio frequencies (for science missions the amateur option is no longer an option)
- ...

Mission's expectations

Primary objective

- Measure Essential Climate Variables :
  - Total Solar Irradiance
  - Earth Radiation Budget
- Characterize the instrument's accuracy and limitations

A future constellation ?

A larger fleet would be able integrate the measures worldwide and monitor the Sun-Earth Imbalance

Our future with Cubesats

Trying larger Cubesats

Examine a 12U solar radiometer cubesat

- Can fit a conventional DIARAD radiometer
- Has enough power
- Sufficient mass for thermal insulation
- Longer lifetime (higher mass and redundant systems)

Our future with Cubesats

Perspectives to experiment

Test new and examine old technology in orbit

- Paint or nanotubes
- Cryogenic radiometers
- Radiometer topologies
- Electronics

Thank you for your attention!