CUBESATS ACTIVITIES AT THE UNIVERSITY OF LIÈGE

Xavier Werner
Space Structures and Systems Lab.
Aerospace & Mechanical Engineering Dept.
University of Liège

Valéry Broun, Sebastien De Dijcker, Serge Habraken, Gaëtan Kerschen, Jacques Verly

HEPL
Haute Ecole de la Province de Liège

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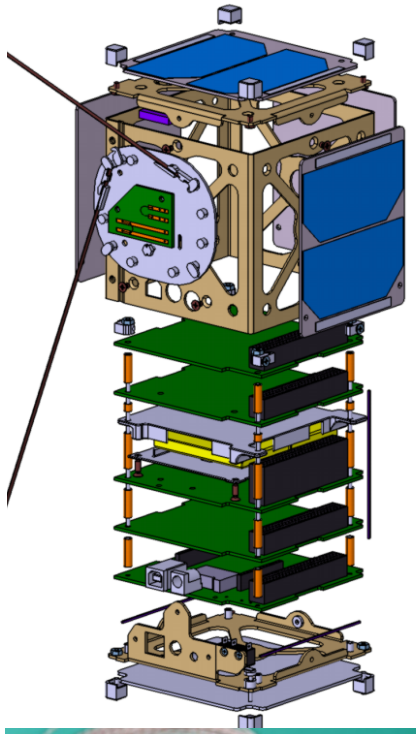
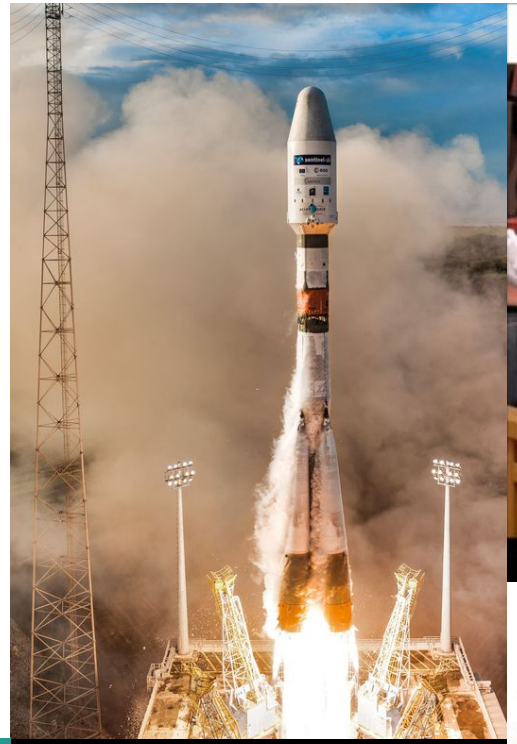
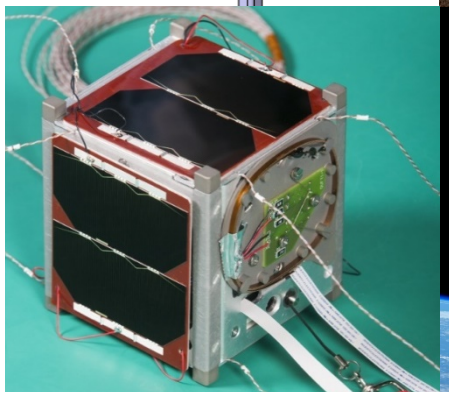
OUFTI-1

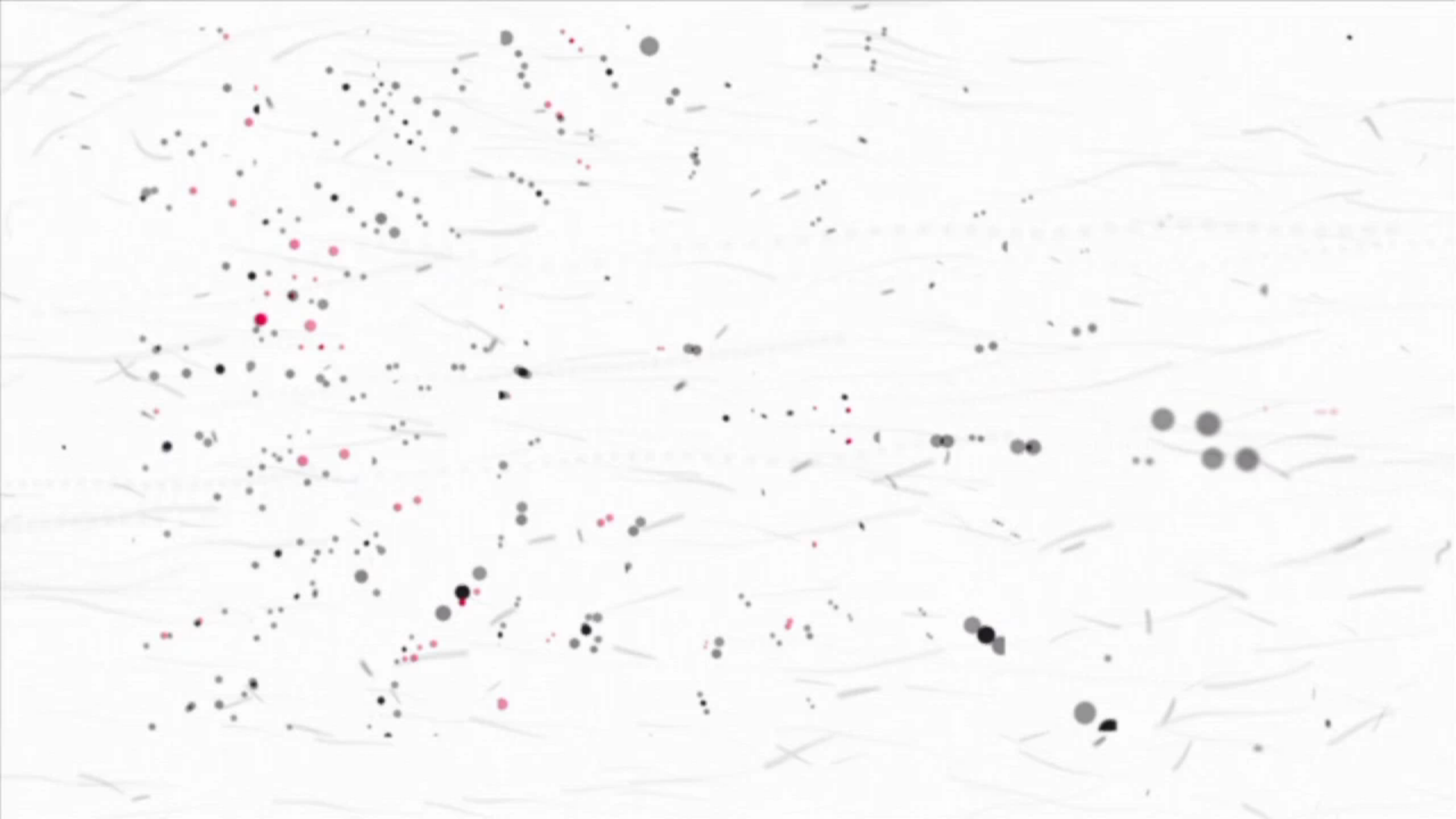
Orbital Utility For Telecommunication Innovation-1







OUFTI-1, Belgium's first nanosatellite, launched 25 April 2016 on Soyuz Flight VS14 under 1st FYS programme



OUFTI-1 heard all over the world!

> 500 Beacon messages received from HAM operators

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OUFTI-2

Orbital Utility For Telecommunication Innovation-2

OUFTI-2 missions

Primary

- **D-STAR**: Provide D-STAR amateur radio communication repeater in space

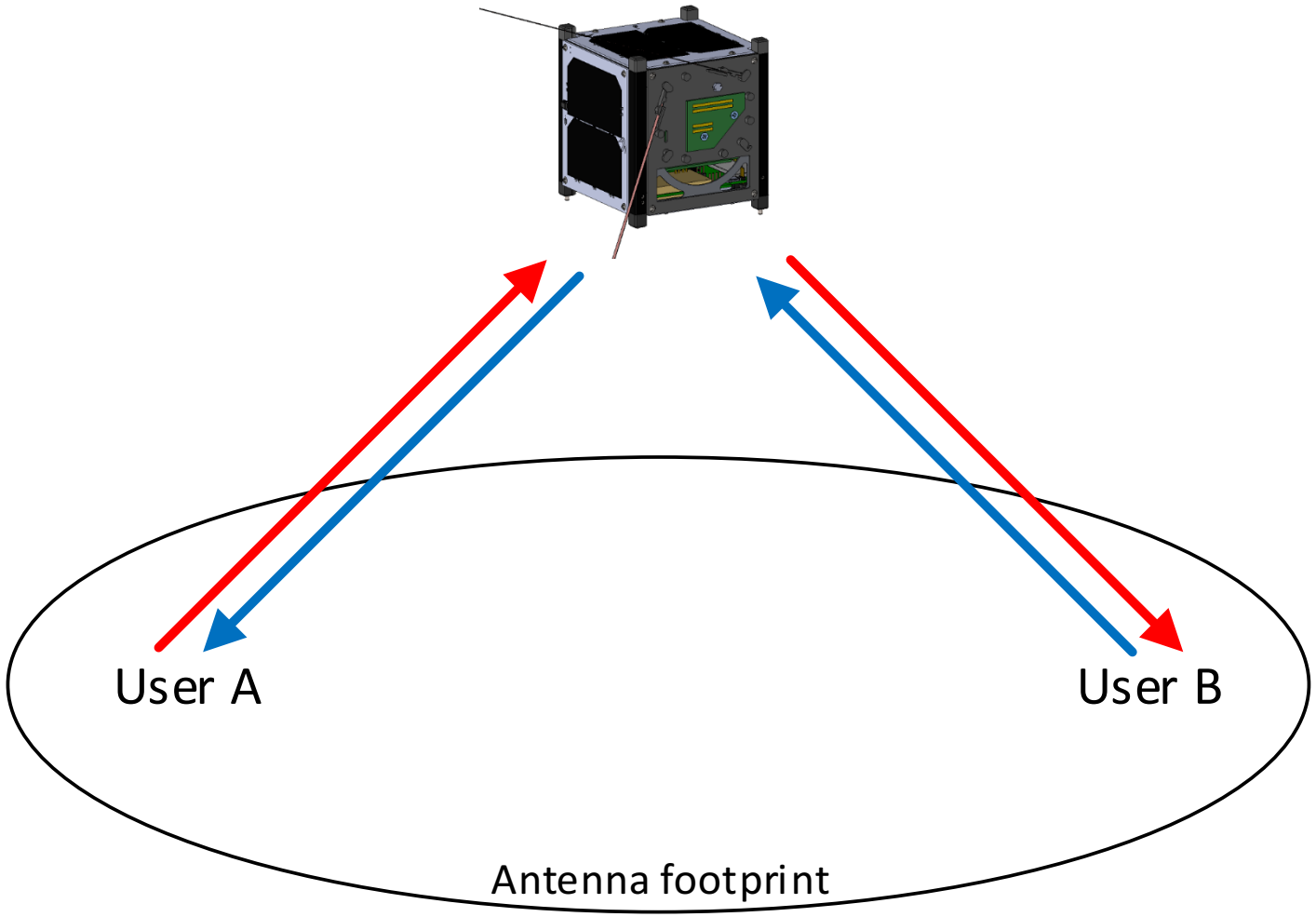
Secondary

- **RAD**: Test two different types of shields to protect electronics from space ionizing radiations
- **IMU**: Estimate attitude of satellite using inertial & magnetic measurements (conceived & built by high-school students)

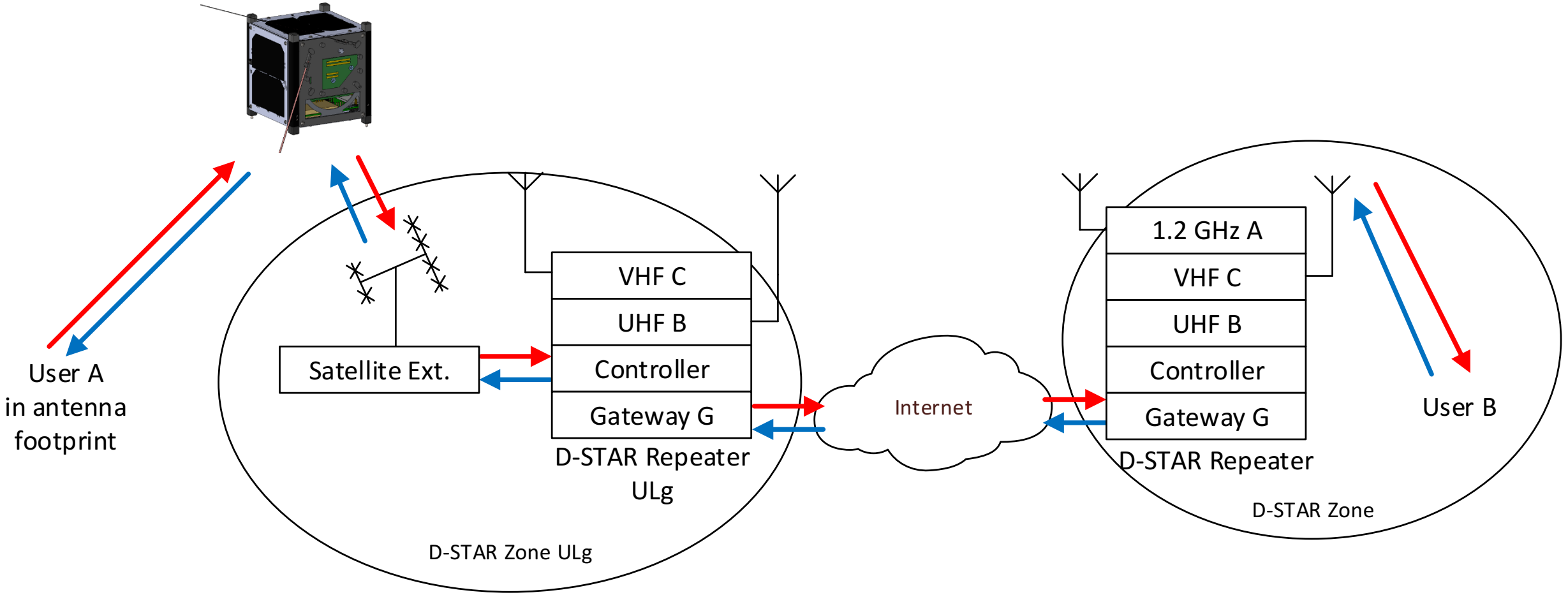
What is D-STAR?

- **Digital-Smart Technology for Amateur Radio**
- **Digital communication protocol**
- **Voice & data transmission**
- **Radio & internet (roaming)**
- **Radio transmissions on VHF, UHF, and L bands**
- **Data: 1200 bps - Voice: 3600 bps (AMBE encoding)**
- **GMSK modulation**

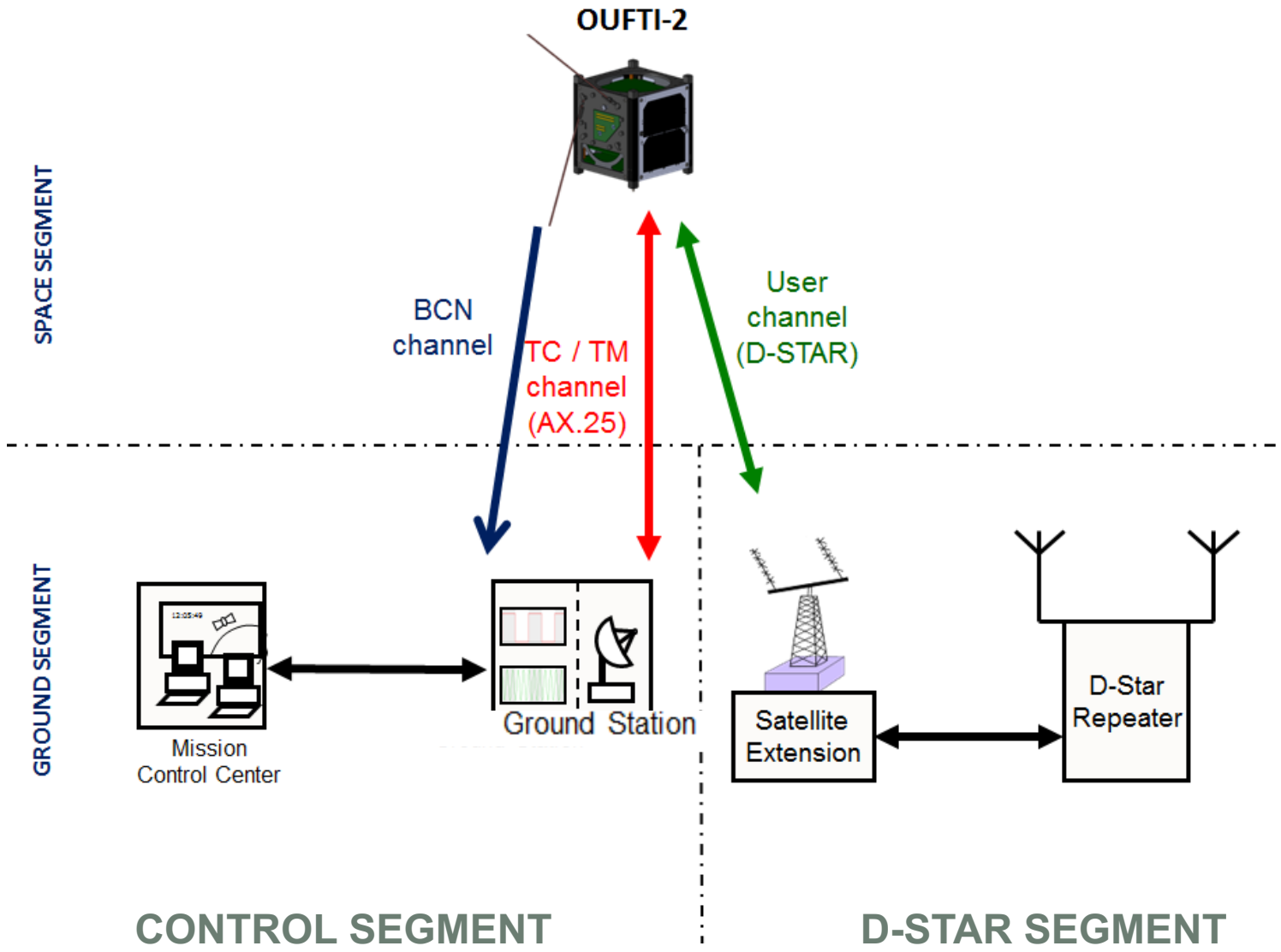
How amateur-radio operators will use OUFTI-2 (1)



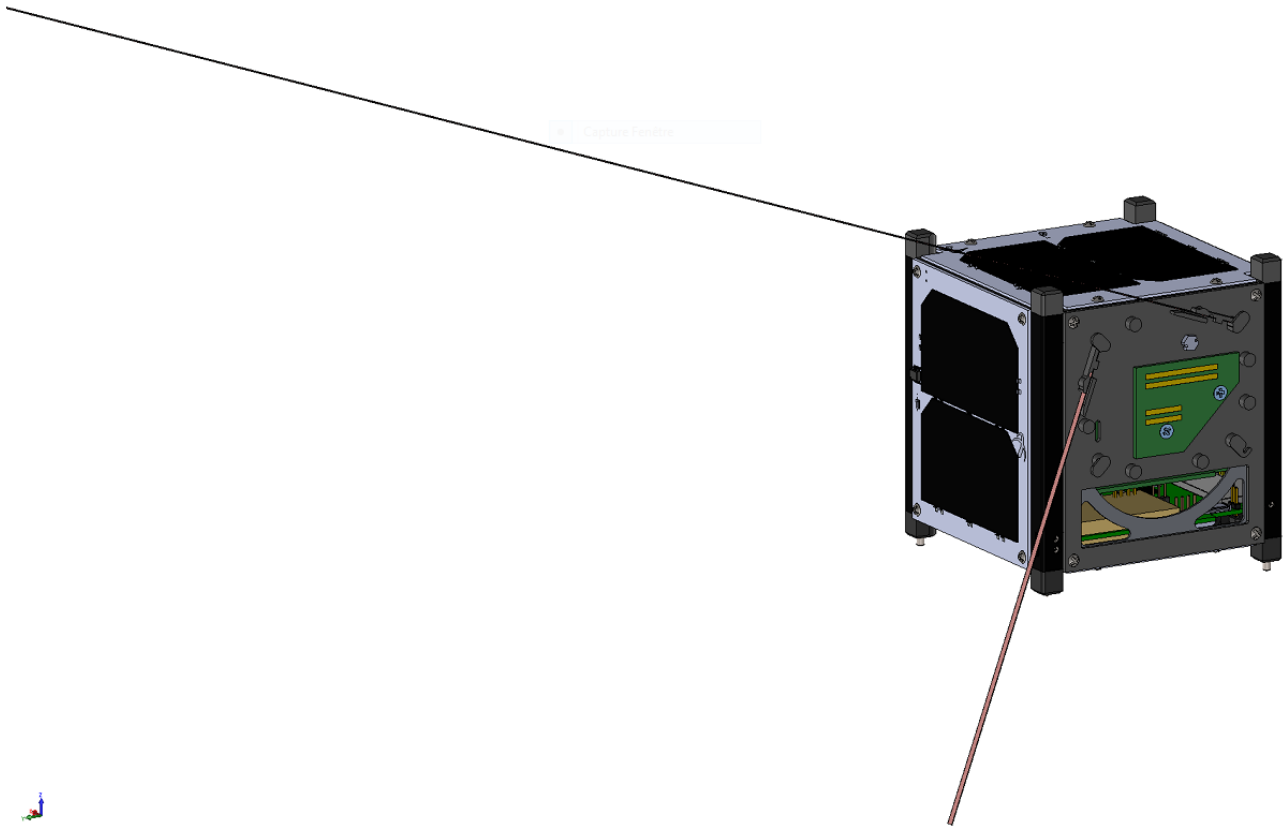
How amateur-radio operators will use OUFTI-2 (2)



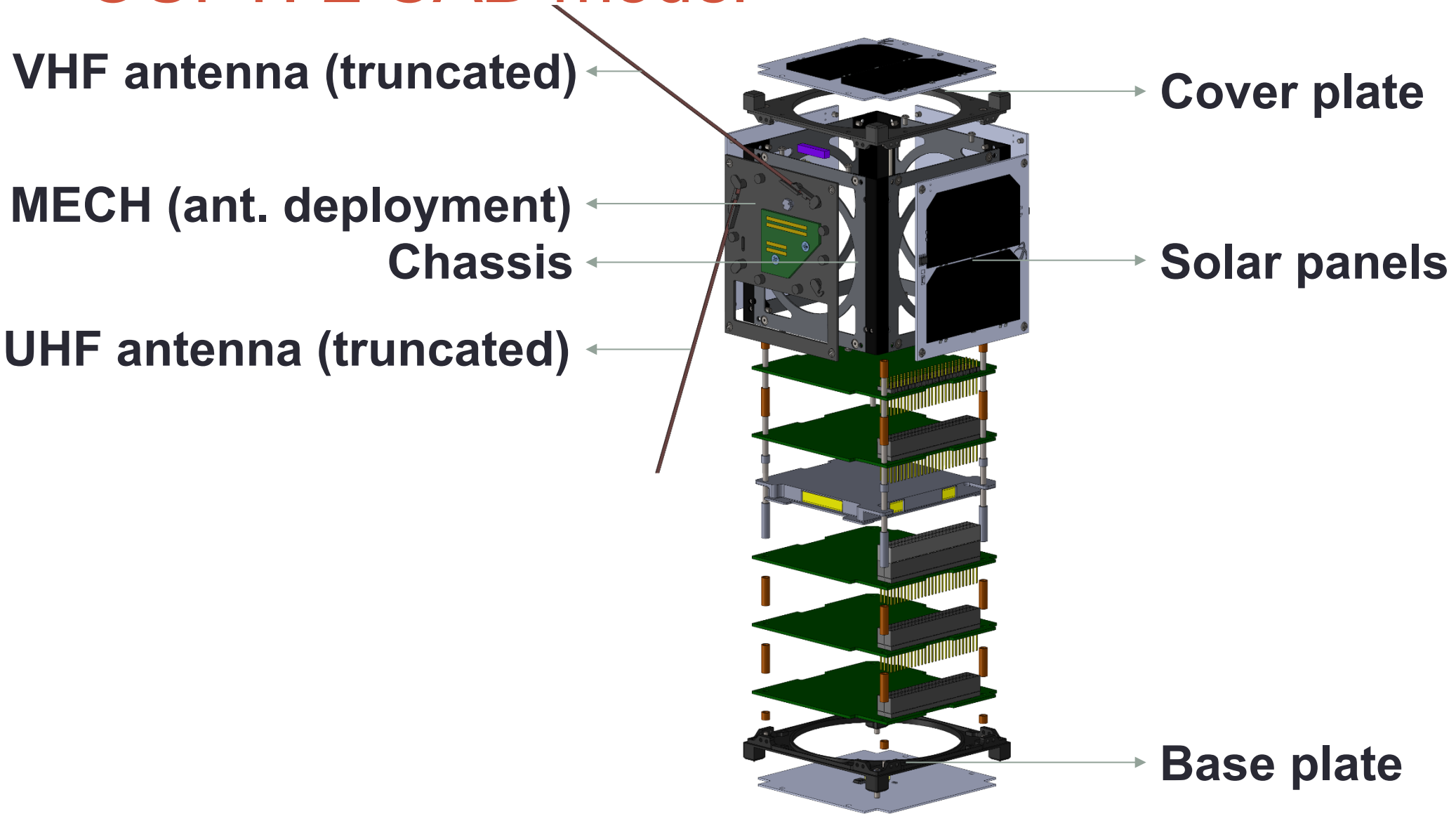
Complete OUFTI-2 system: space & ground segments



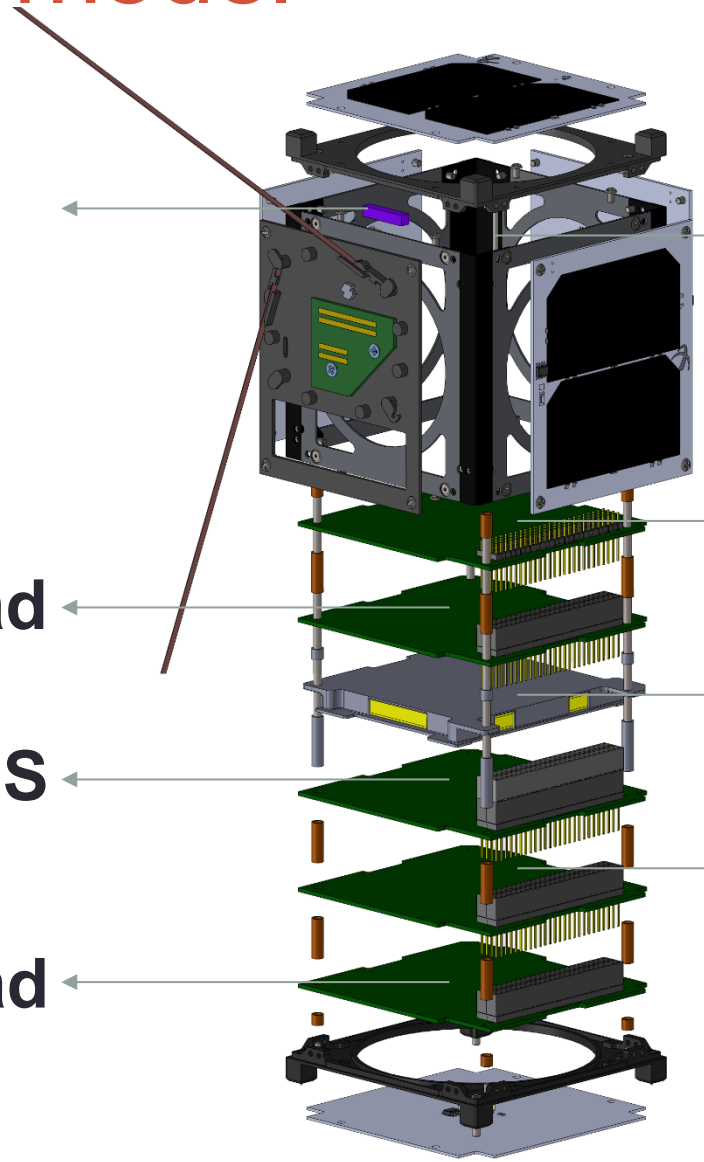
Space segment



OUFTI-2 CAD model



OUFTI-2 CAD model



ADCS (permanent magnet)

ADCS (hysteretic rods)

AX.25 & D-STAR payload

BCN & IMU payload

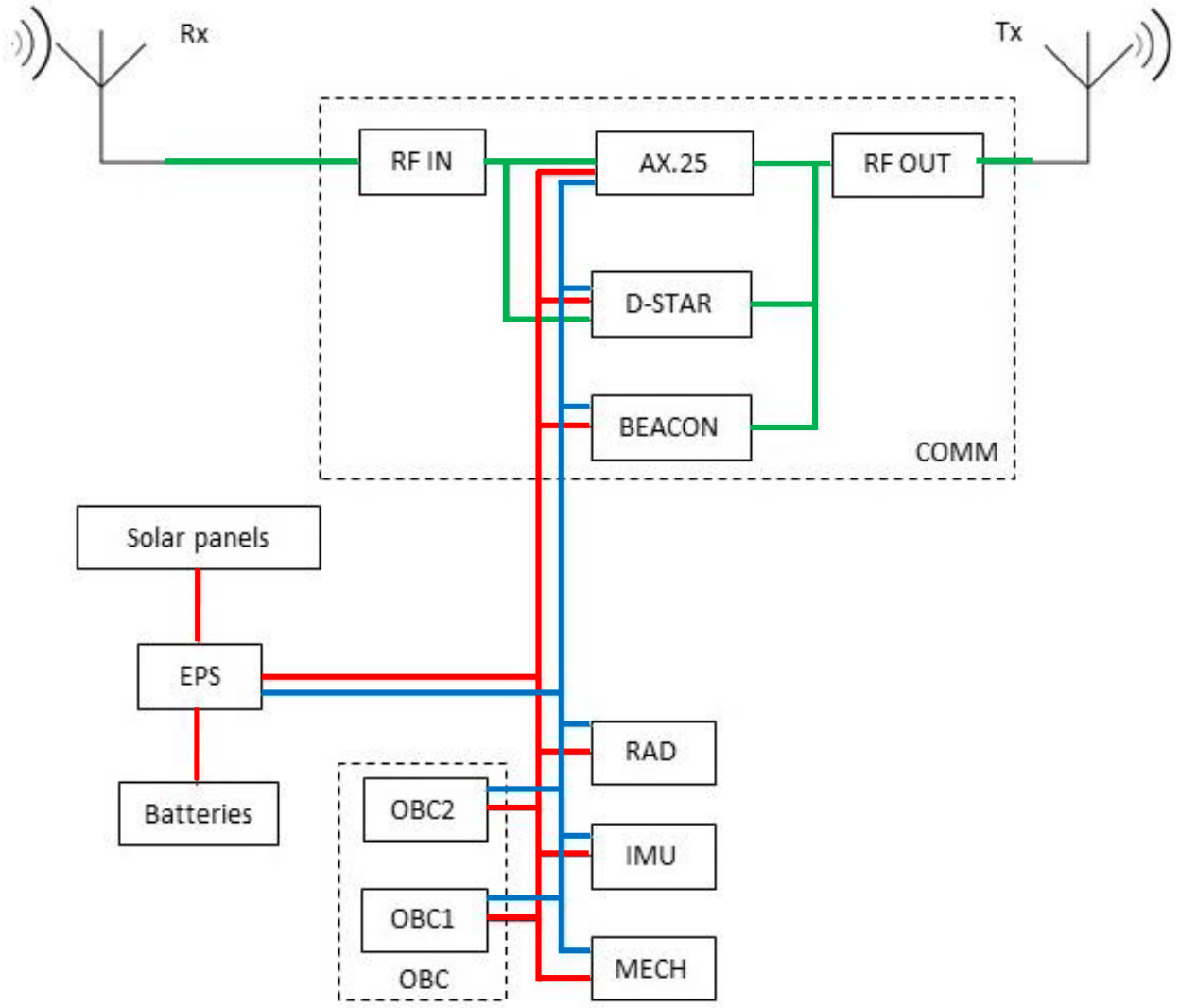
Batteries

EPS

OBC

RAD payload

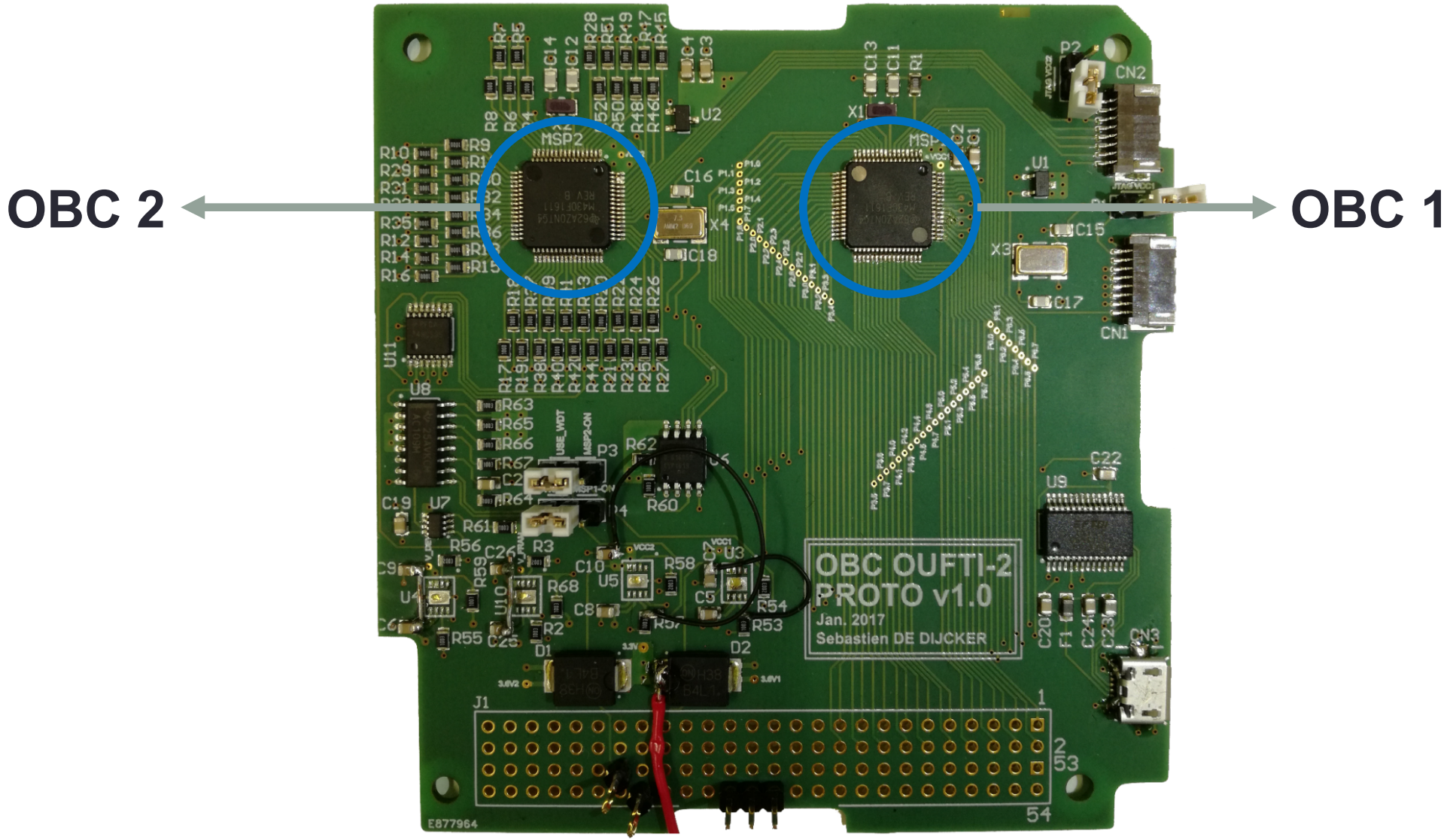
OUFTI-2: hardware architecture



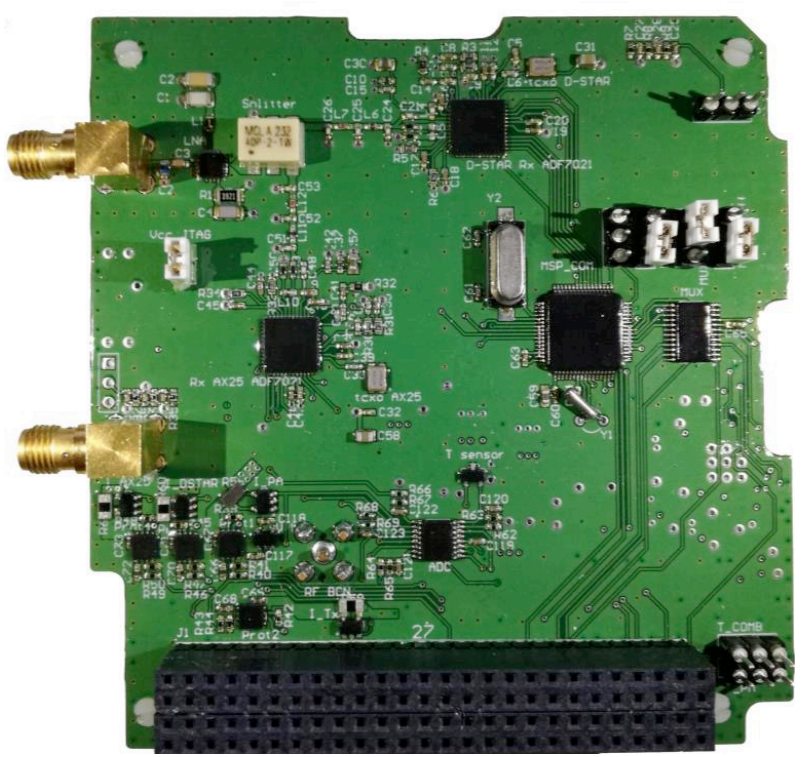
Radio link
Power link
Data link

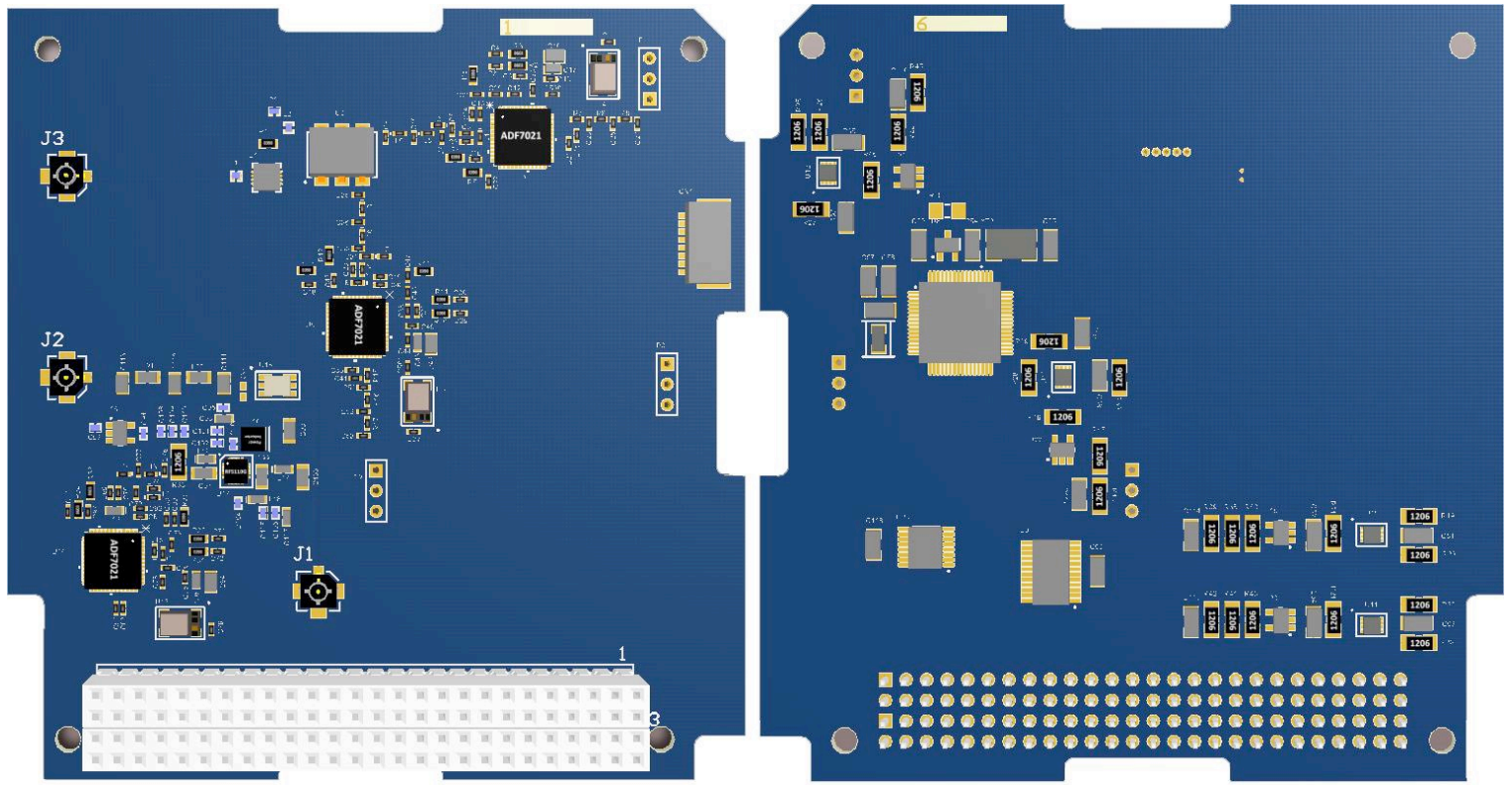
Let's take a photo tour of OUFTI-2 CubeSat !

On-board computer (OBC): OBC1 & OBC2

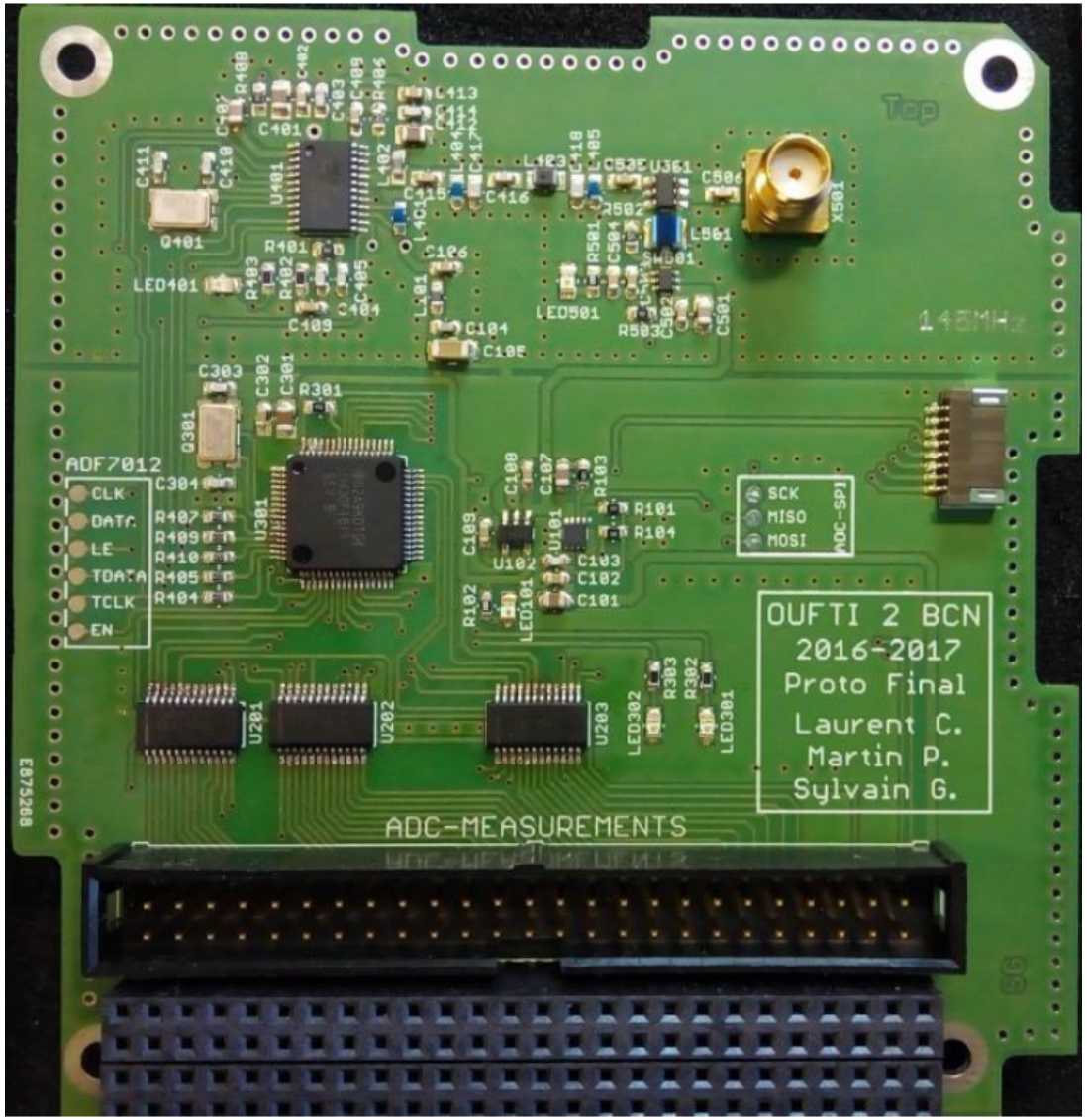


Communication (COMM): AX.25, D-STAR, RF-IN/OUT





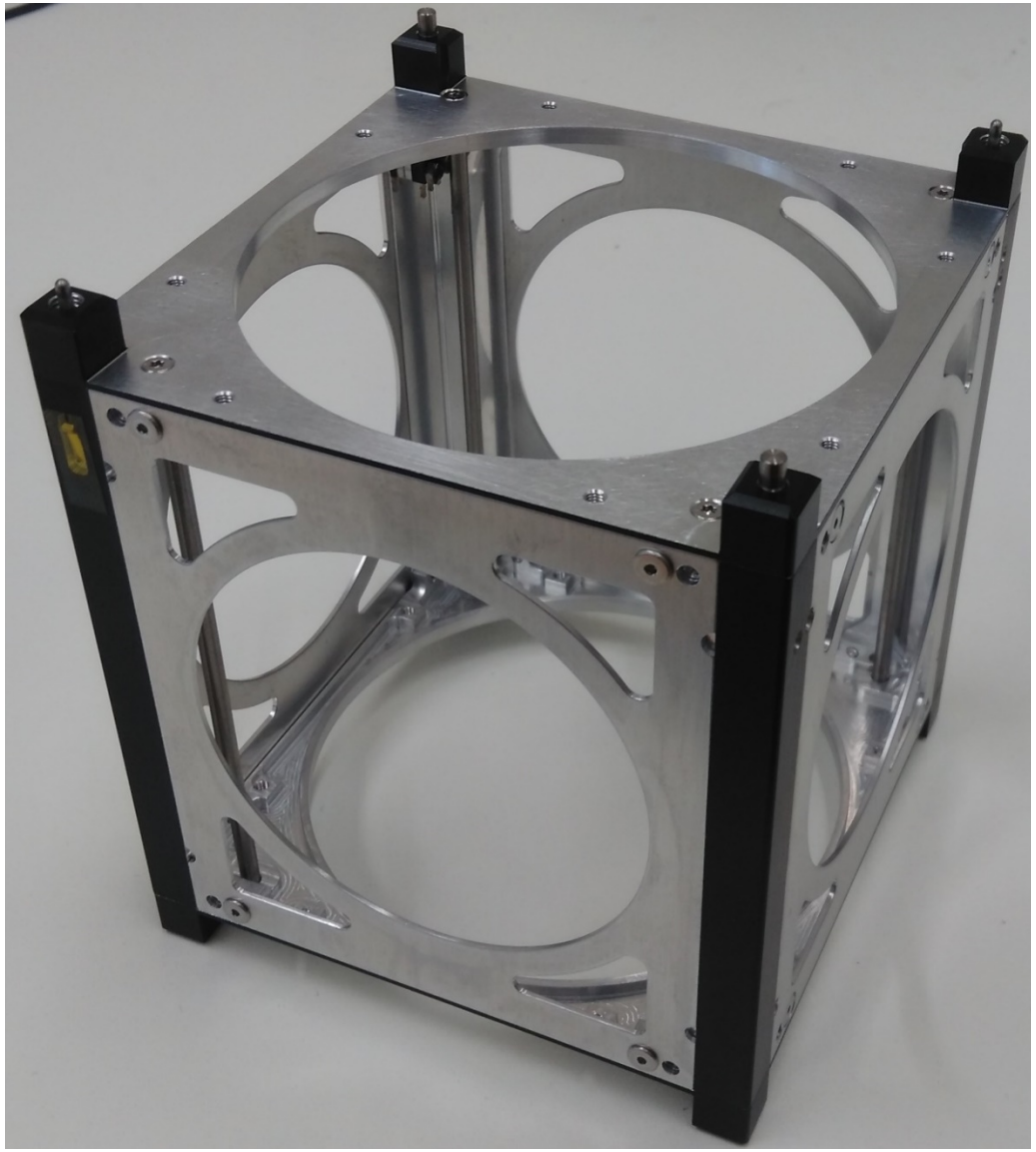
Communication (COMM): BCN



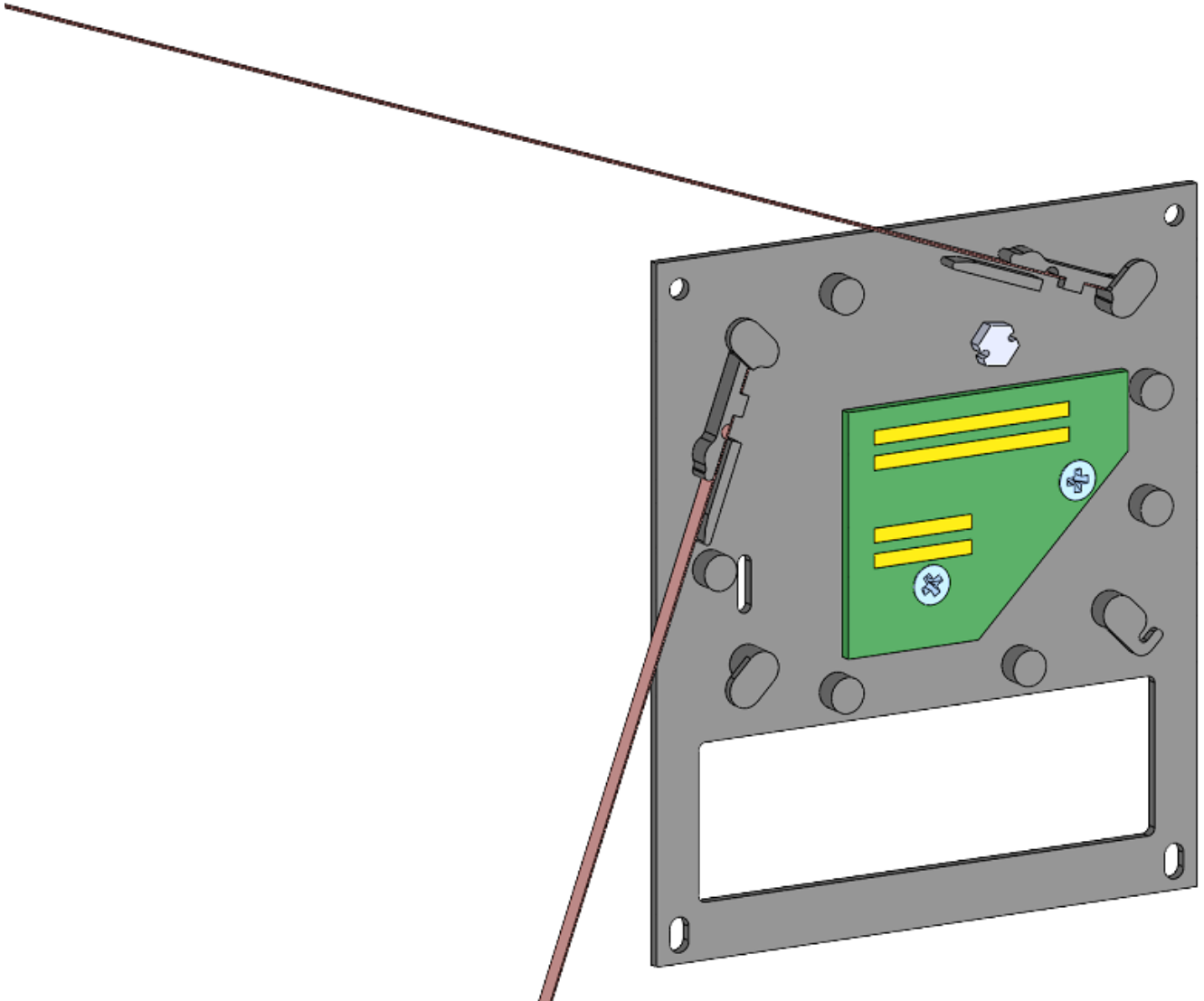
Batteries


MAX RECHARGING VOLTAGE : 4.2V
MAX RECHARGING CURRENT : 1500mA
MAX DISCHARGE CURRENT:
12A/22.5A
(Read contents of backside)
SLPB
1500mAh
SUPERIOR LITHIUM POLYMER BATTERIES
08C/3.7V/TW/5.55Wh
KBGTWWB25A
Kokam
Great Power for Everyone
www.kokam.com
Model : SLPB603870H

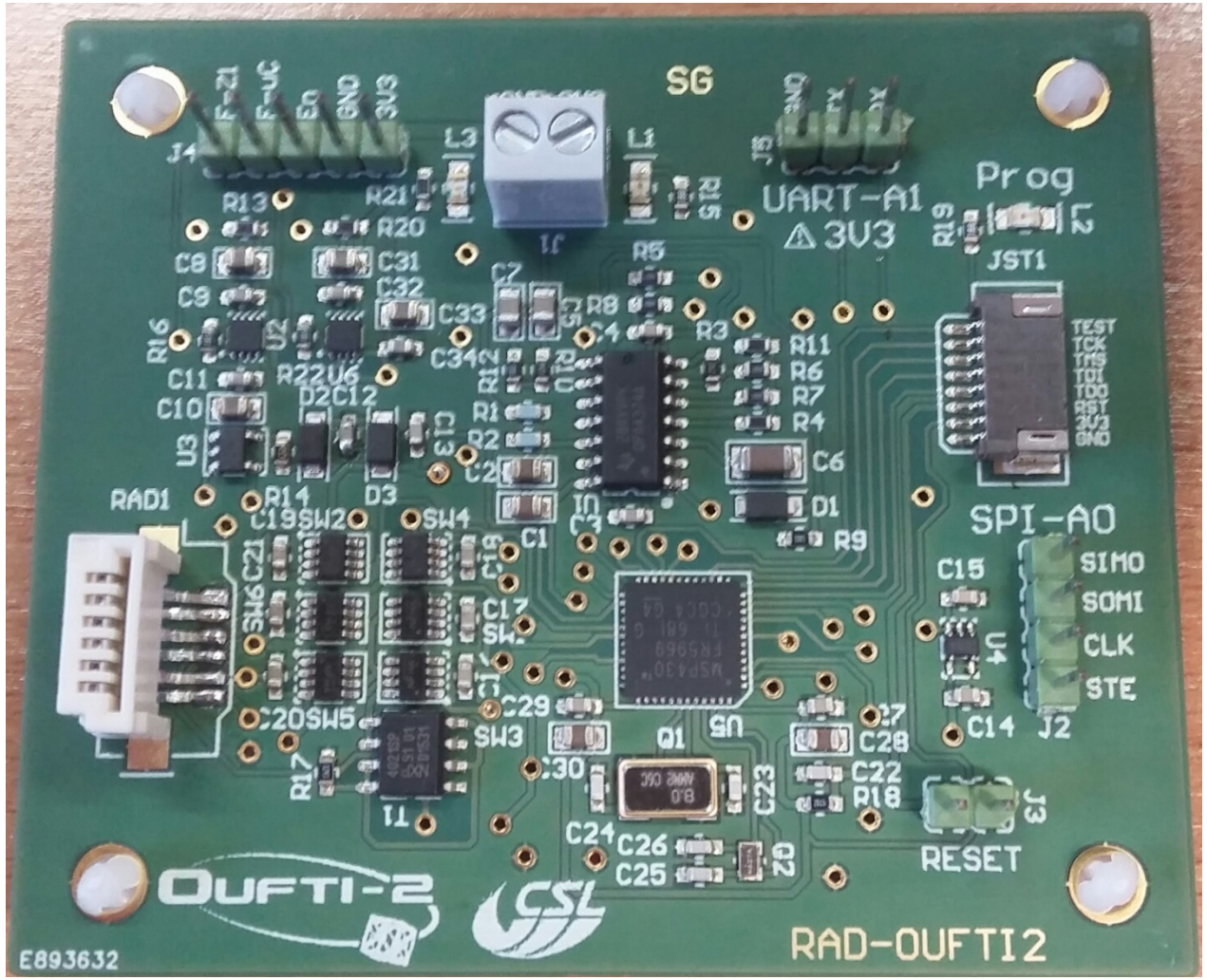
Structure (STRU) & solar panels

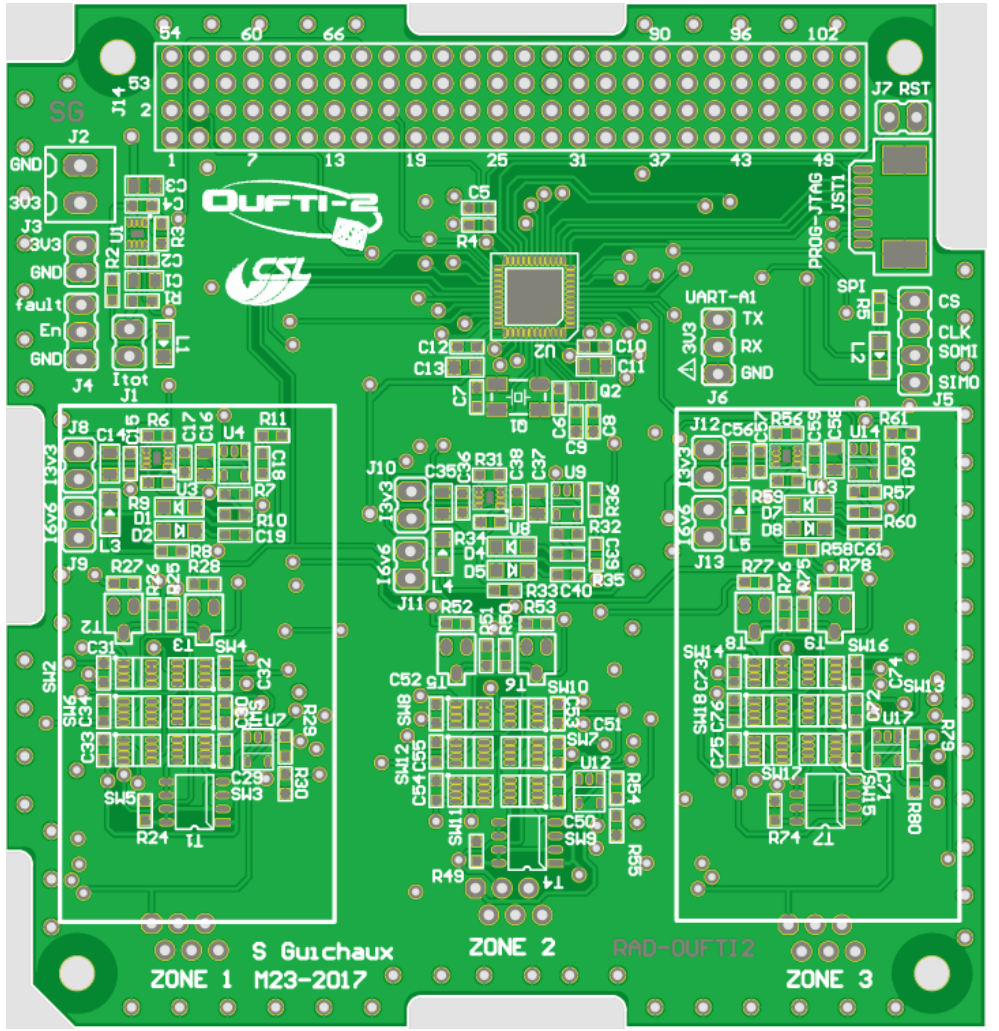


Mechanical systems (MECH): antennas deployment system

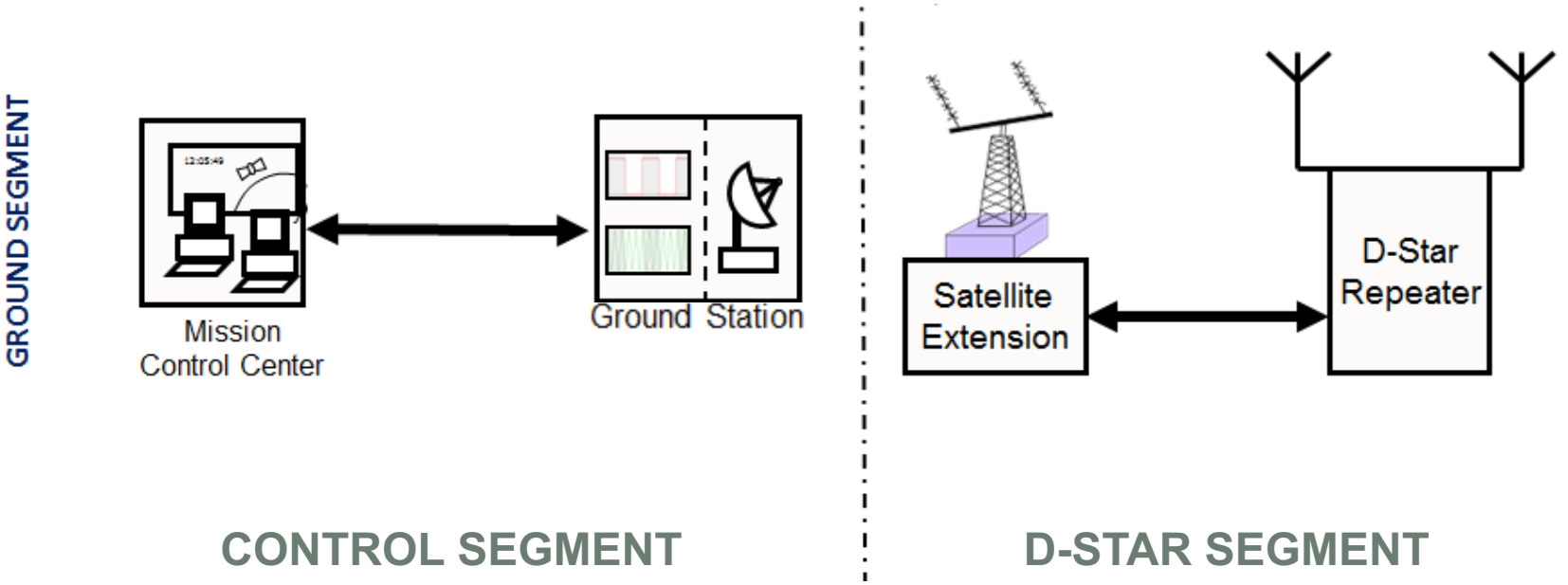


First secondary payload: RAD

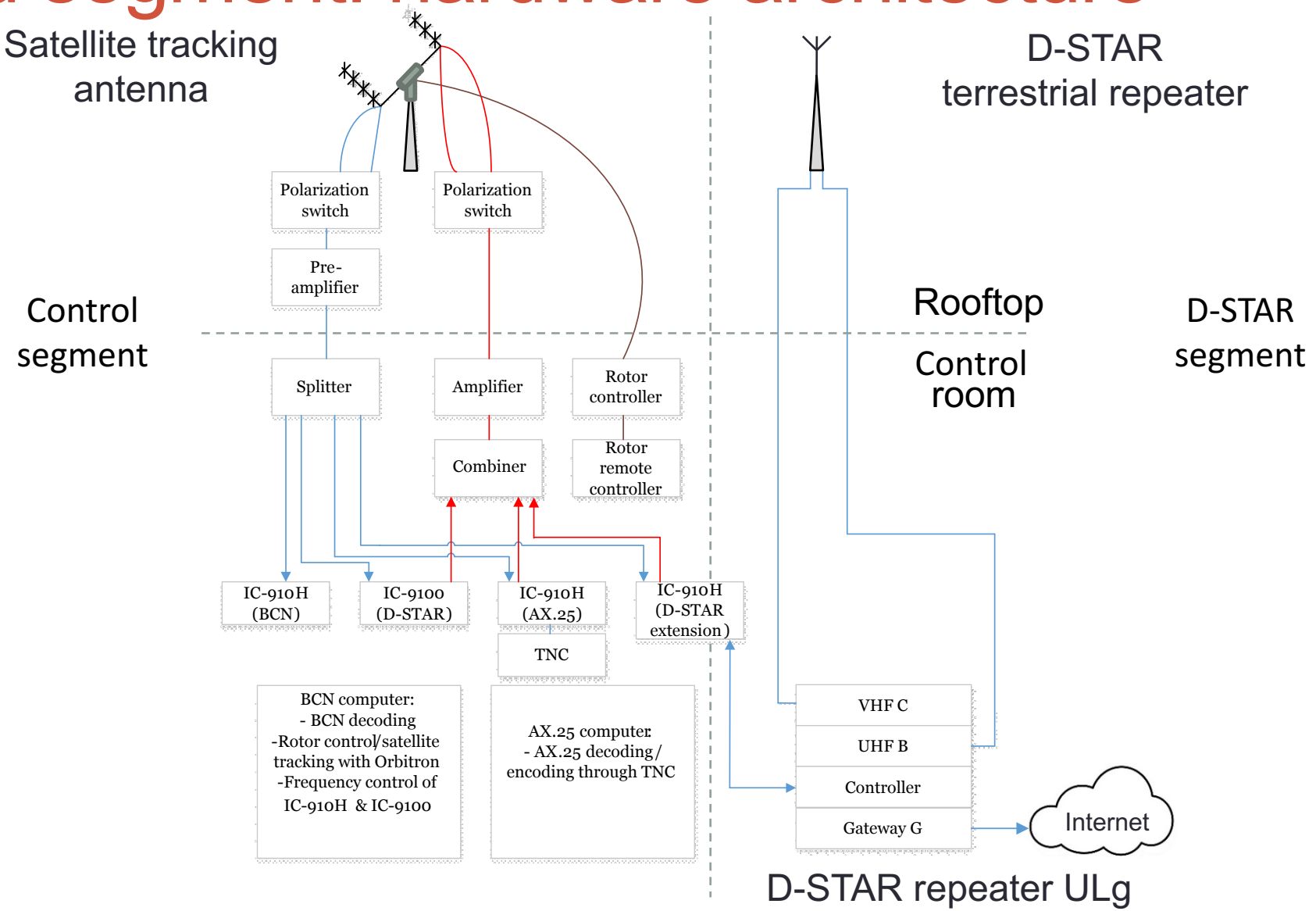




Ground segment



Ground segment: hardware architecture



Let's take a photo tour of OUFTI-2 ground segment !

Ground segment: control room

Ground segment: rooftop

Satellite tracking antenna

D-STAR repeater antenna

OUFTI-NEXT

Orbital Utility for Thermal Imaging (TBC)

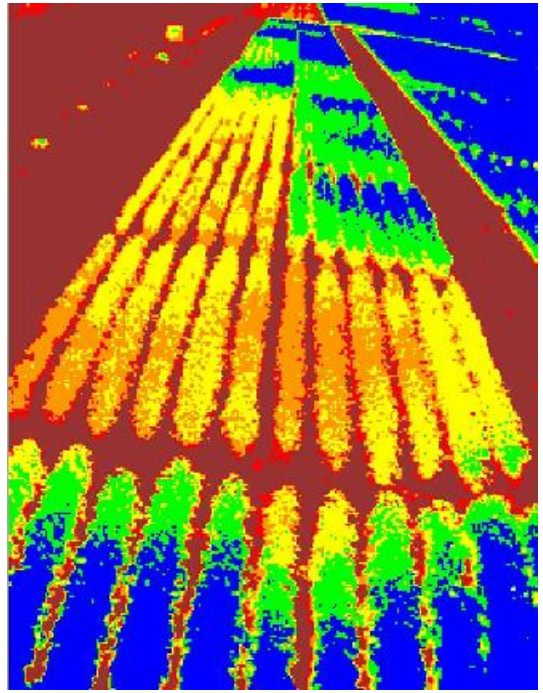
Mission concept

- Smart irrigation strategy of agricultural fields

→ Possibility to detect lack of water by monitoring the leaf surface temperature

- 69% of water used for agriculture
- 40% of the fields are irrigated

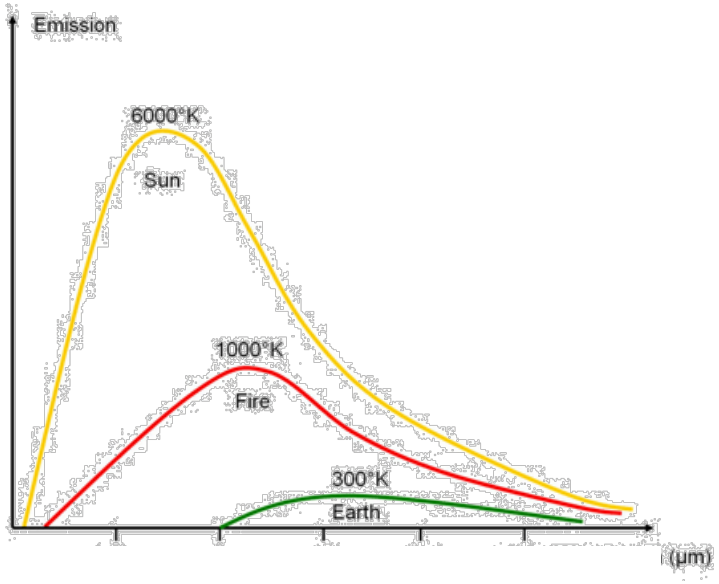
→ high potential applications

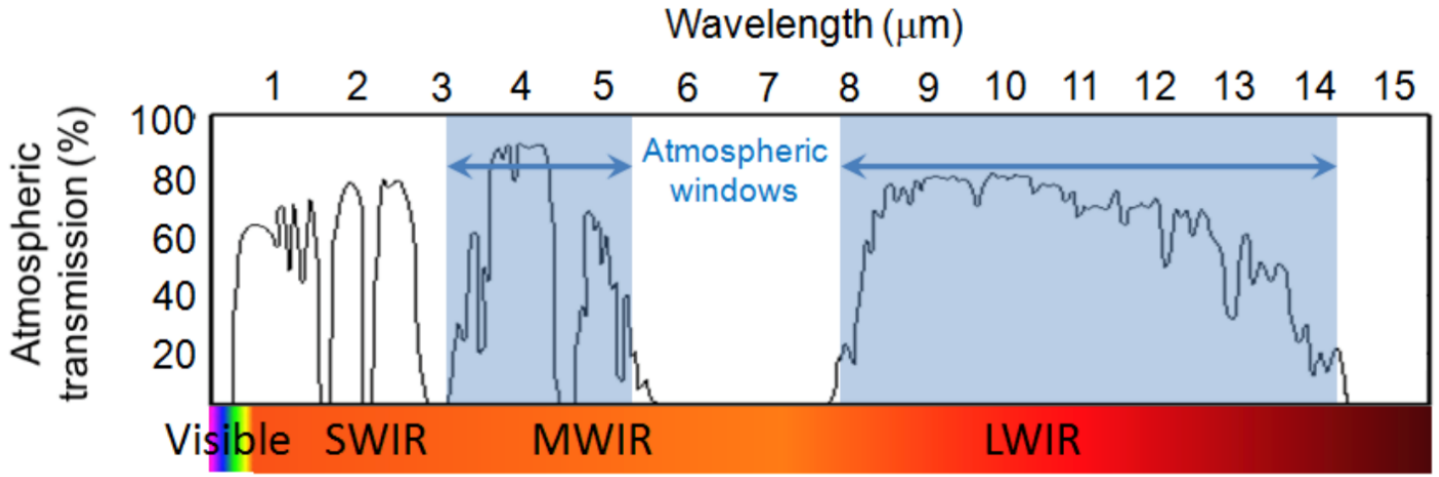


Mission specification

Long term goal:

- 50m resolution
- Daily revisit (constellation)
- Mid-wave IR





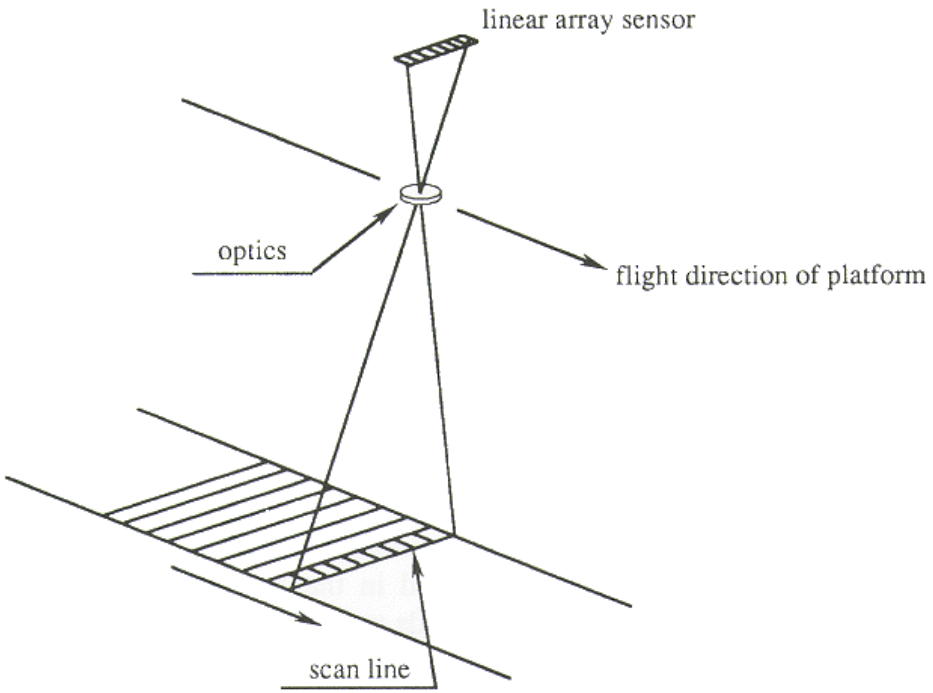
Preliminary feasibility study

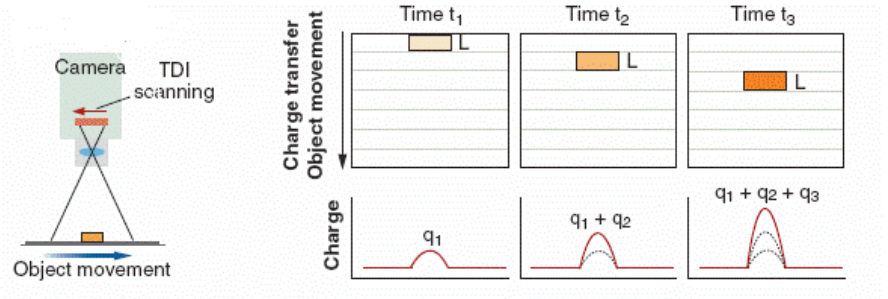
Feasibility study of an in-orbit demonstrator:

- 100m ground resolution
- CubeSat standard
- Fast development (<2 years)
- Collaboration between FSC, CSL and FS.

Payload

- Developed by CSL
- Mid-wave IR telescope
- Time Delayed Integration (TDI) linear scan

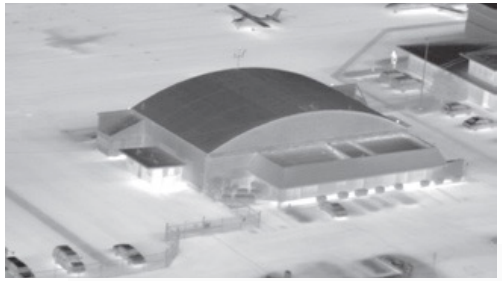




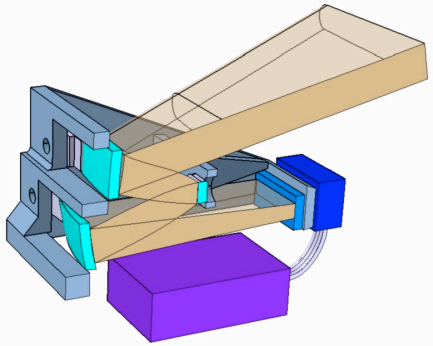
Payload

- MWIR cooled detector

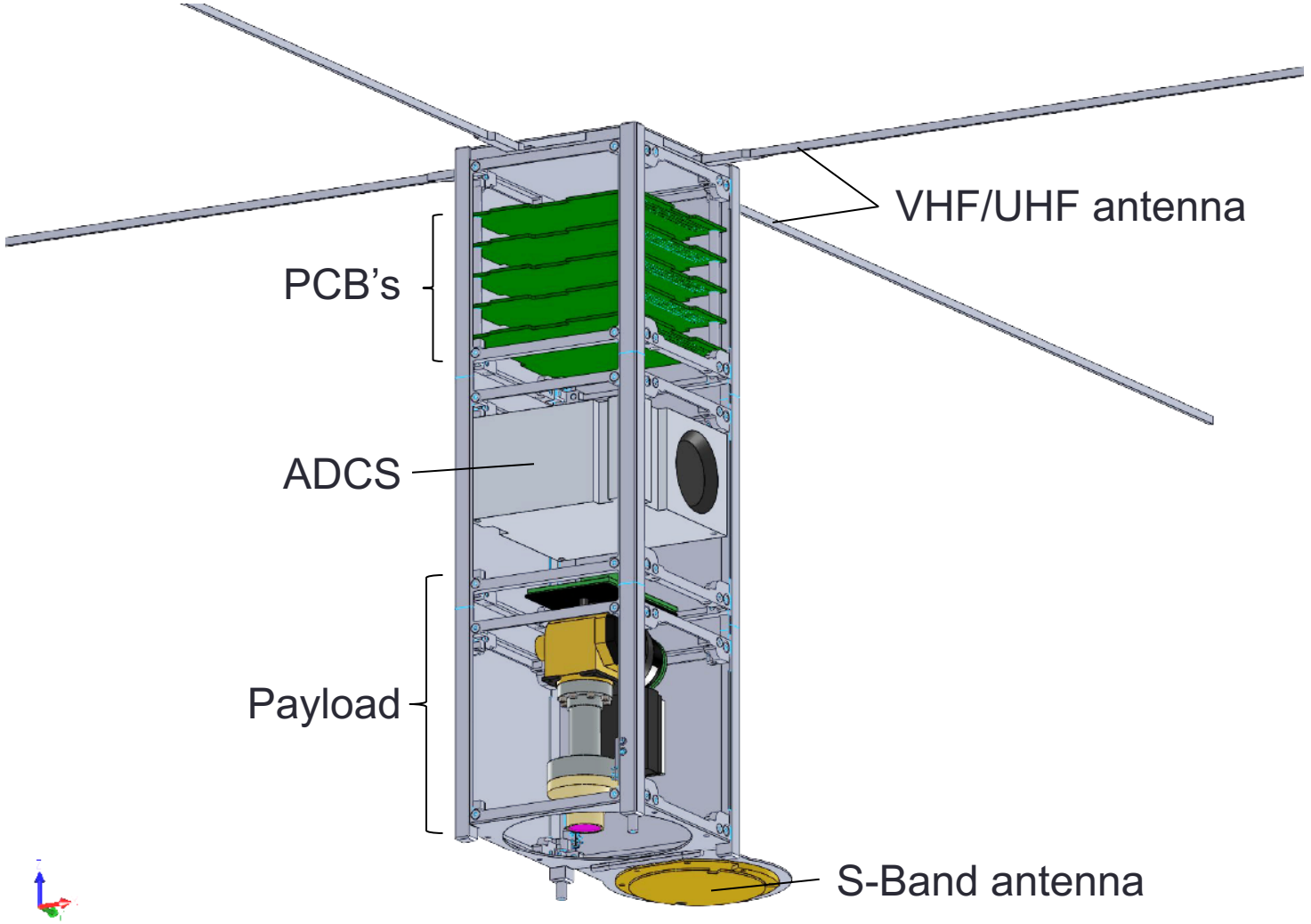
Neutrino™	
Thermal Imager	640 x 512, (15µm pitch) MWIR InSb
FPA / Digital Video Display Format	640 x 512
Analog Video Display Format	640 x 512 (PAL), 640 x 480 NTSC
Spectral Band	3.4 - 5.1µm Standard
Full Frame Rates	30 Hz (NTSC), 25 Hz (PAL)
Sensitivity (NEdT)	<25mK
Time to Image	<6 min room temp, <10 min at 71°C



- Three Mirrors Anastigmat by Amos
- Visible camera (TBC)

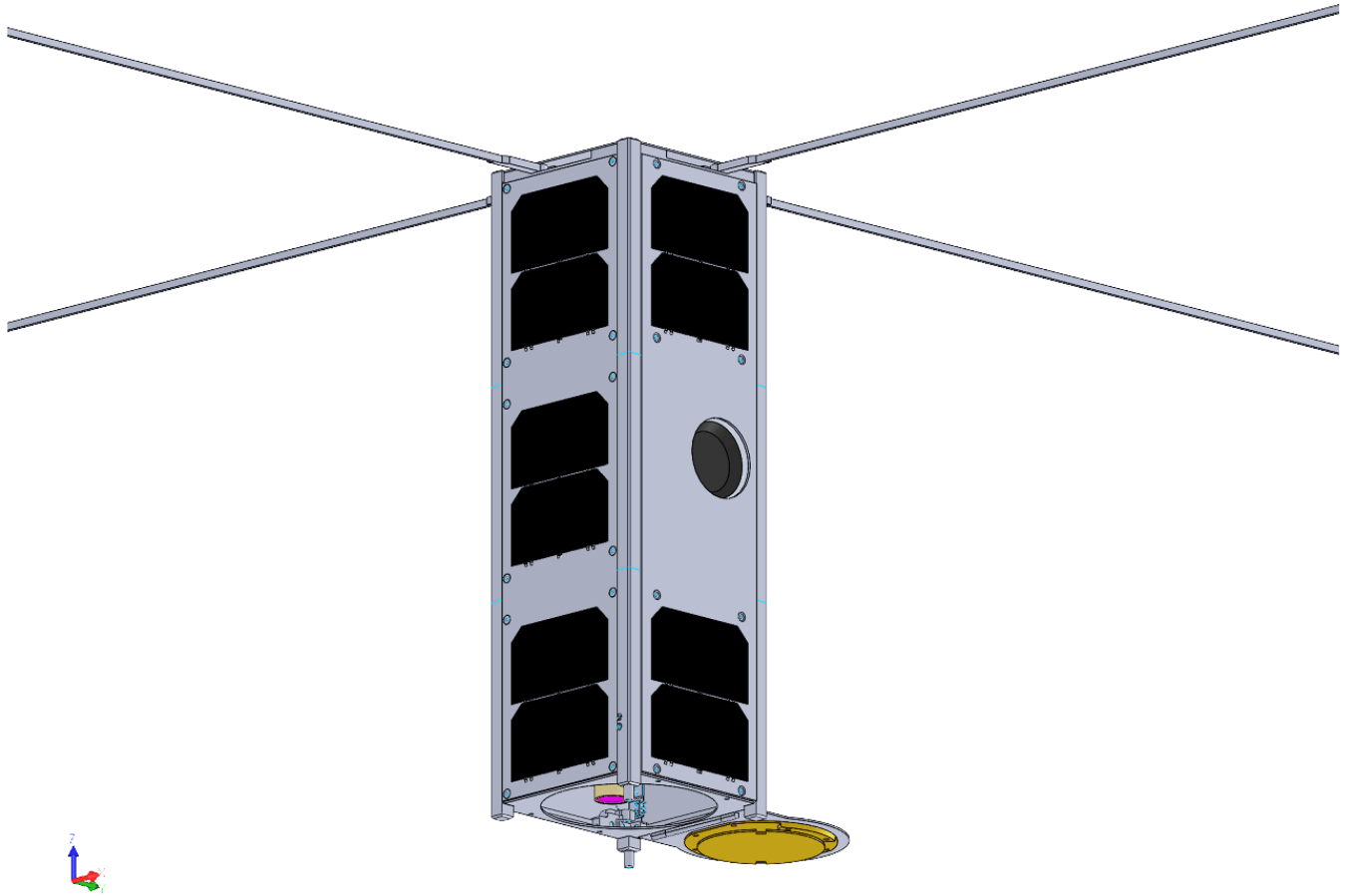


Platform



Platform

- Body mounted solar panels



Thanks for your keen interest!