

# **OUFTI-2 educational CubeSat project of University of Liège, Belgium**

Presented on behalf of OUFTI-2 team by students  
**Thibaut Guillaume** (University of Liège, Belgium) &  
**Adrien Rikir** (Haute Ecole de la Province de Liège, Belgium)

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**Adrien Rikir** (Haute Ecole de la Province de Liège, Belgium)

## Supervisors

**Sebastien De Dijcker** (Univ. of Liège, Dept. of Electrical Engineering & Computer Science, BE)

**Xavier Werner** (Univ. of Liège, Department of Aerospace & Mechanics, BE)

**Valéry Broun** (Haute Ecole de la Province de Liège, Service of Electronics, BE)

**Prof. Jacques G. Verly** (Univ. of Liège, Dept. of Electrical Engineering & Computer Science, BE)

# Student team

4 **Master thesis** students

3 **integrated project** students

7 **volunteer** students



→ 13 students

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# OUFTI-2 is our second satellite!



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

# OUFTI-2 missions

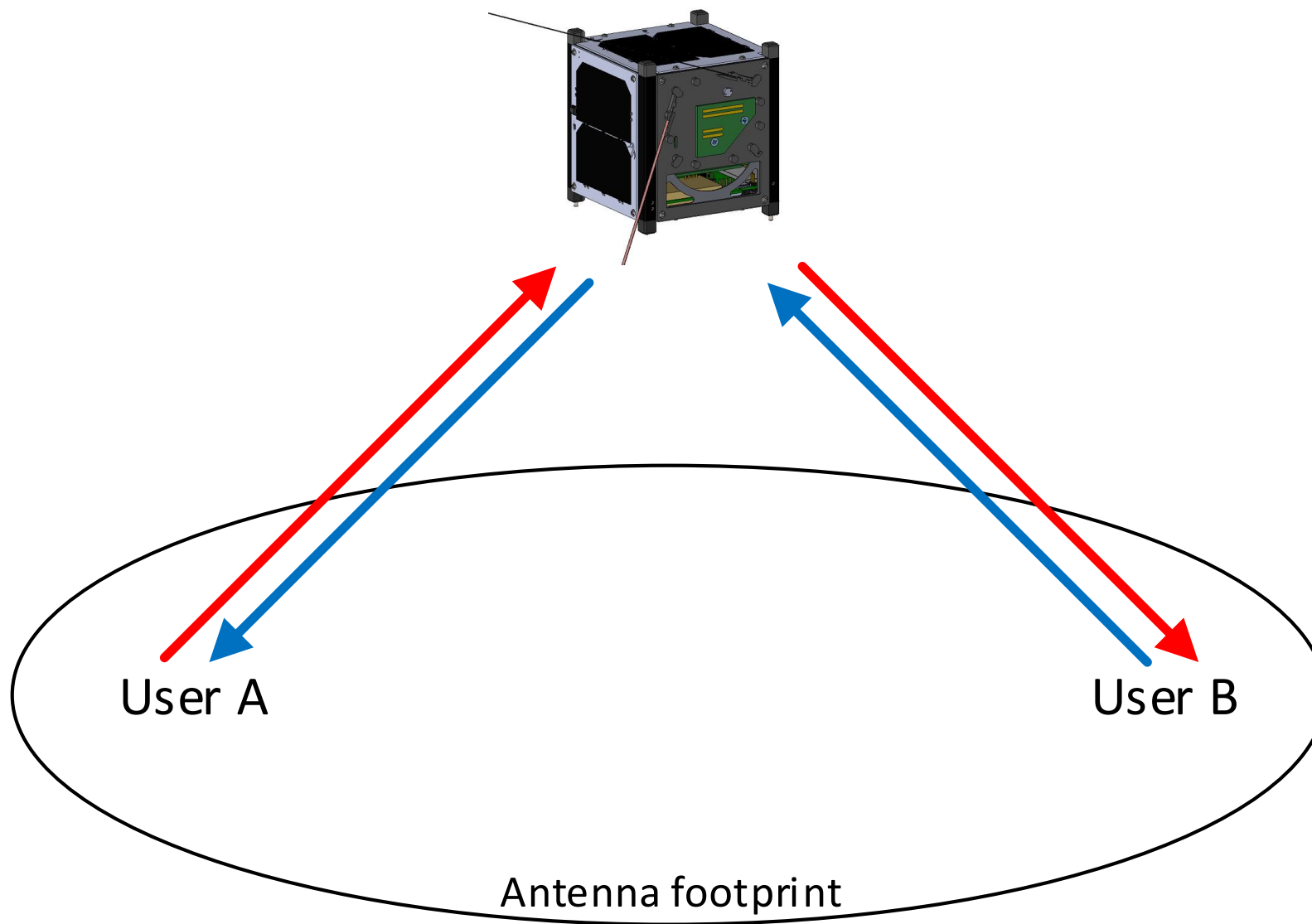
- **Primary**
  - **D-STAR**: Provide D-STAR amateur radio communication repeater in space
- **Secondary**
  - **RAD**: Test two different types of shields to protect electronics from space ionizing radiations
  - **IMU**: Estimate attitude of satellite using inertial & magnetic measurements (conceived & built by high-school students)

# What is D-STAR ?

- **D**igital-**S**mart **T**echnology for **A**mateur **R**adio
- Digital communication protocol
- Voice & data transmission
- Radio & internet (roaming)
- Radio transmissions on VHF, UHF, and L frequency bands
- Data: 1200 bps - Voice: 3600 bps (AMBE encoding)
- GMSK modulation

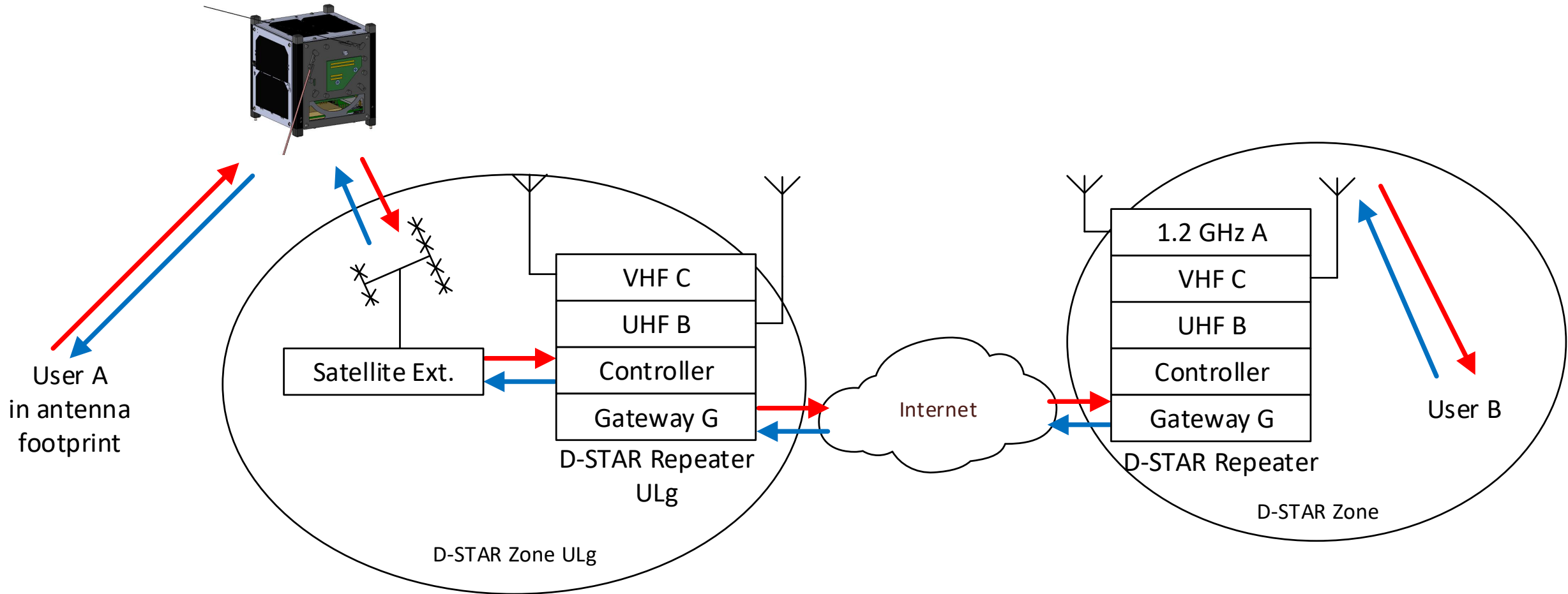


# How amateur-radio operators will use OUFTI-2 (1)

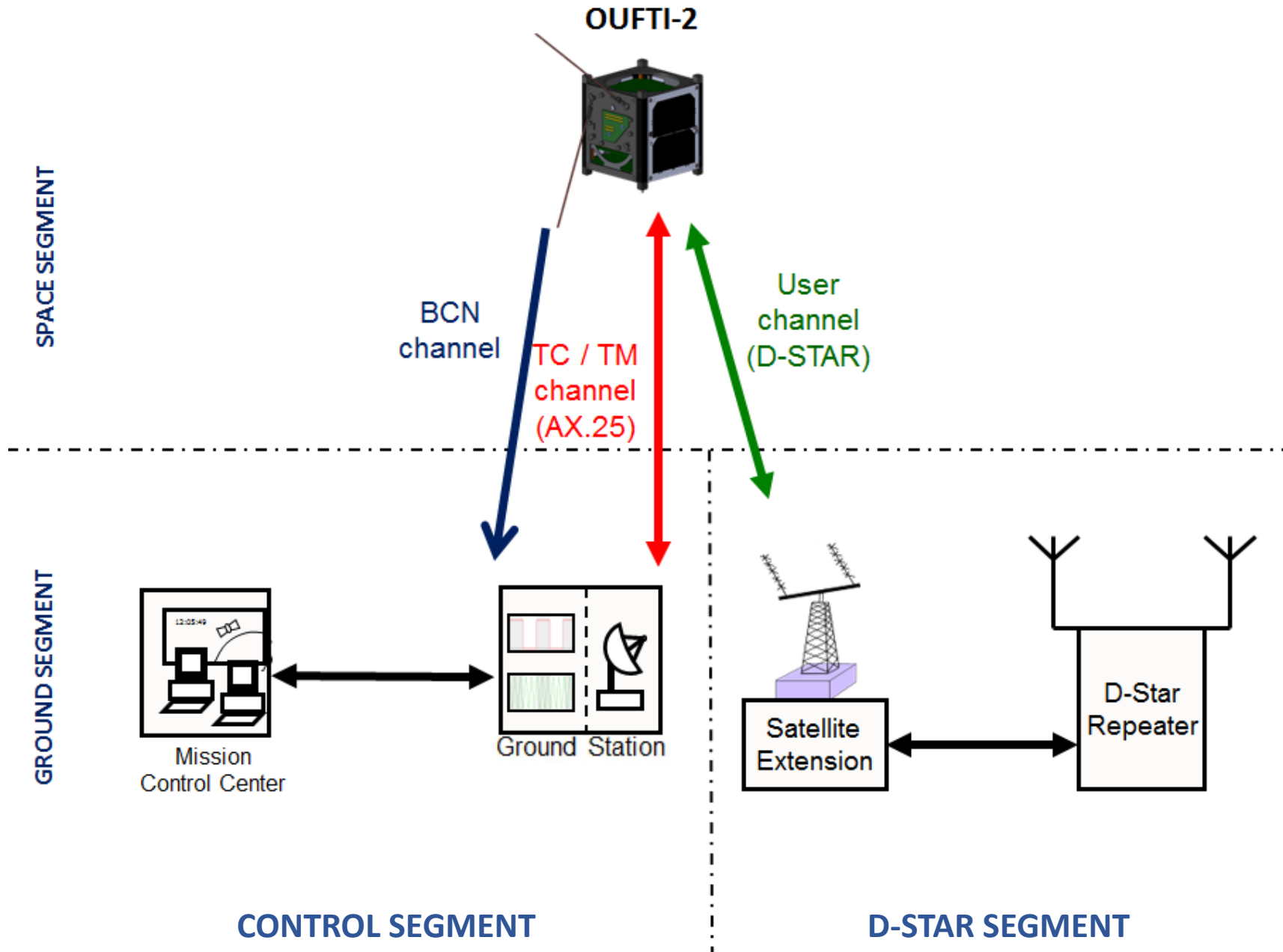




# How amateur-radio operators will use OUFTI-2 (2)

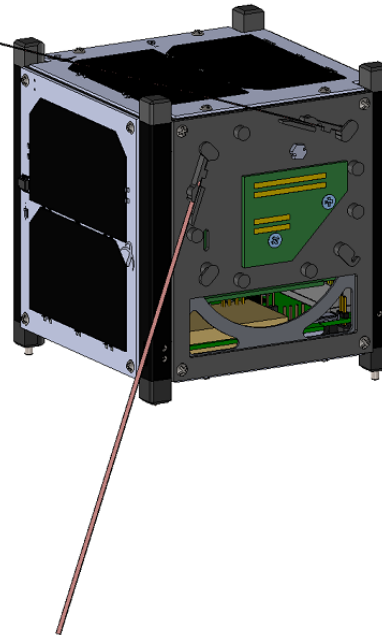


# Complete OUFTI-2 system: space & ground segments

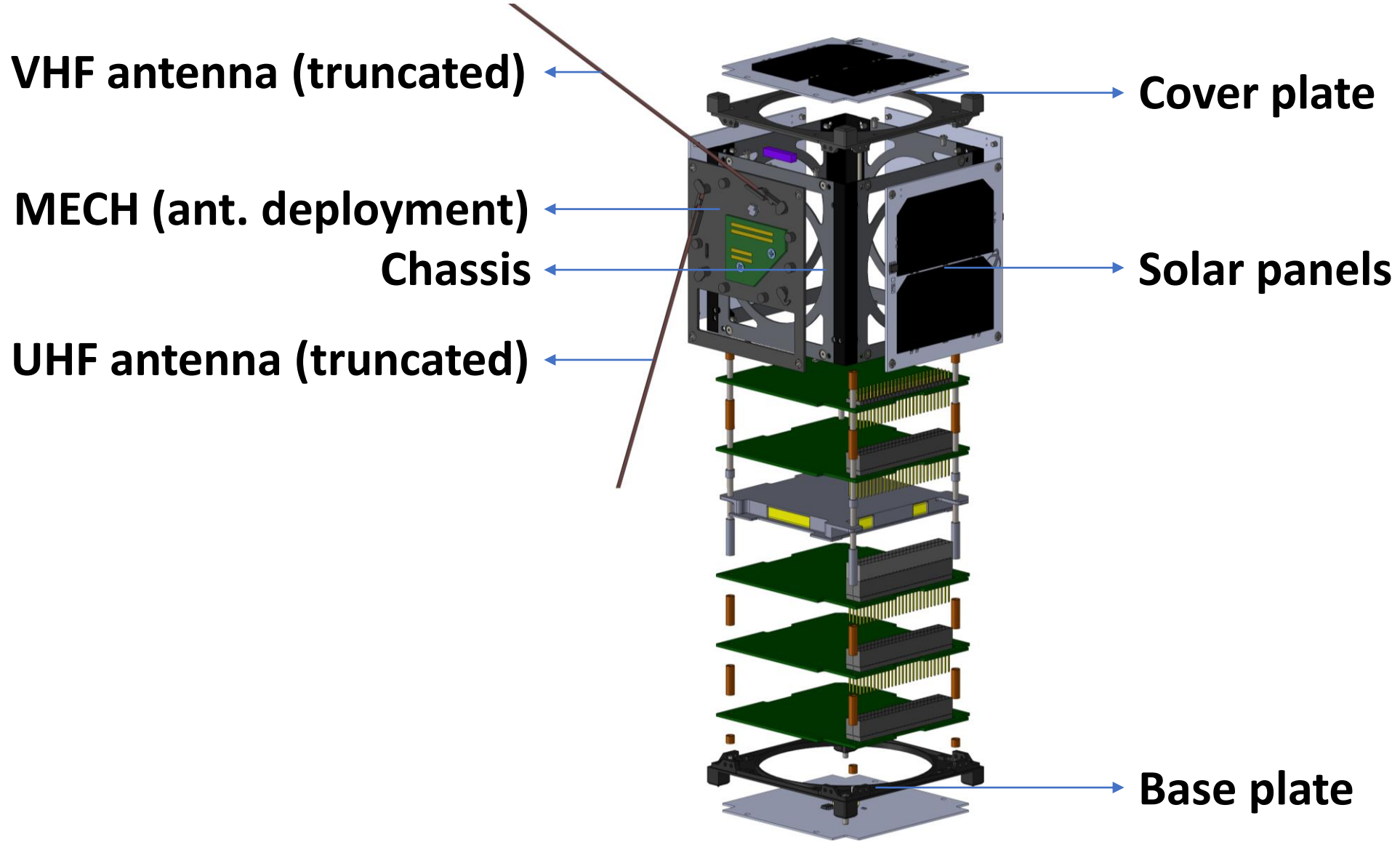


# Space segment

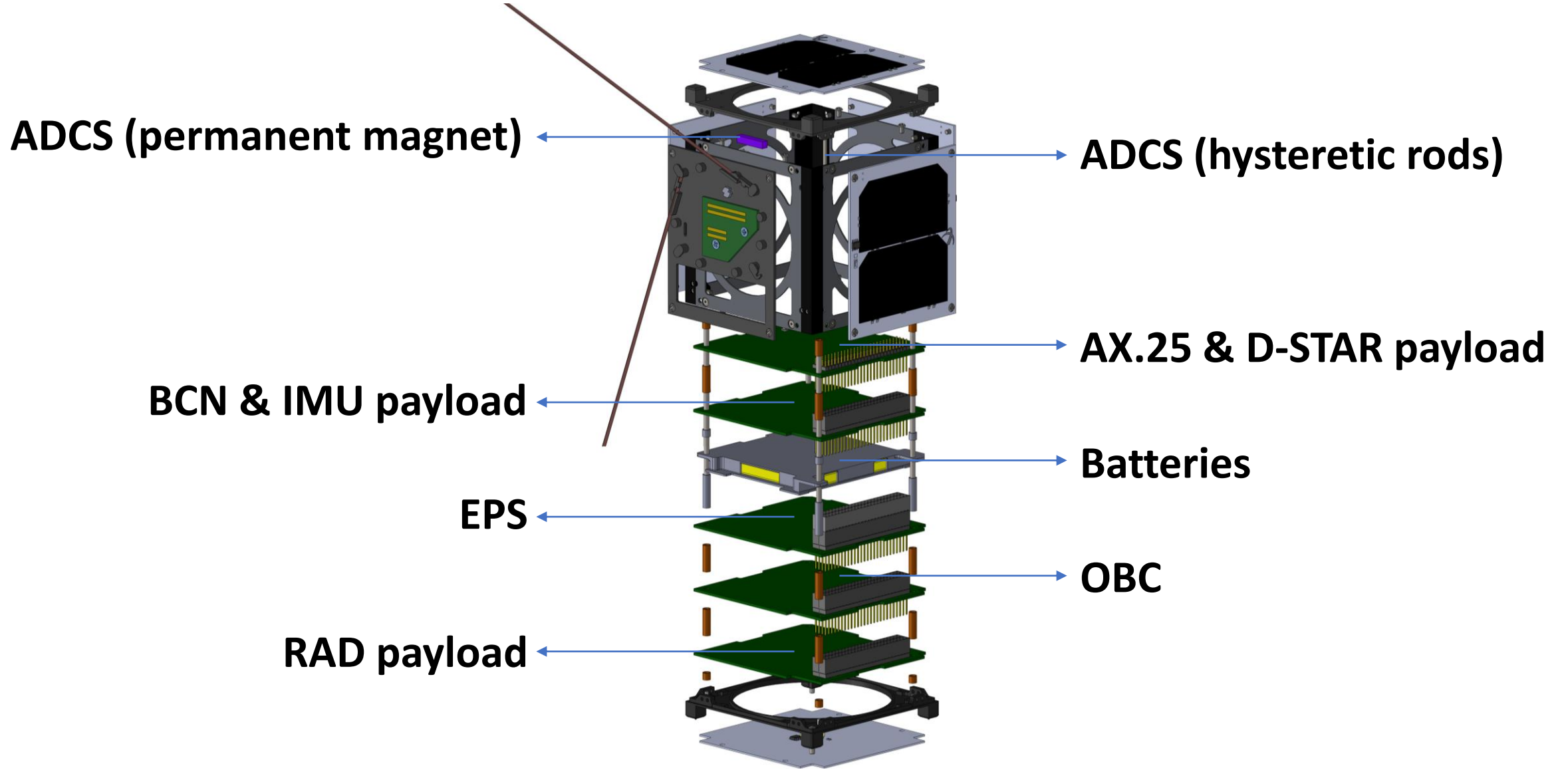
3D Capture Centre



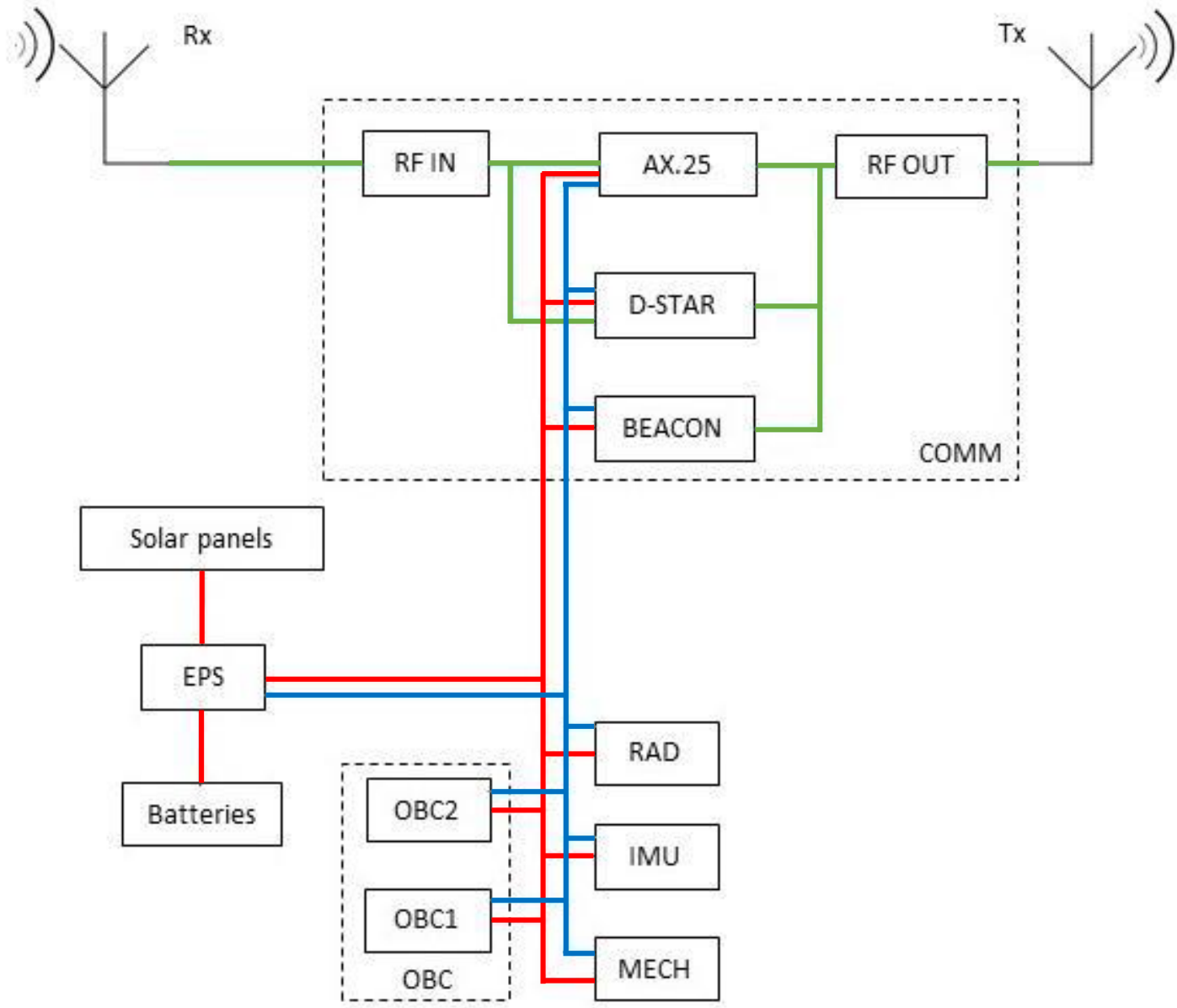
# OUFTI-2: CAD model



# OUFTI-2: CAD model

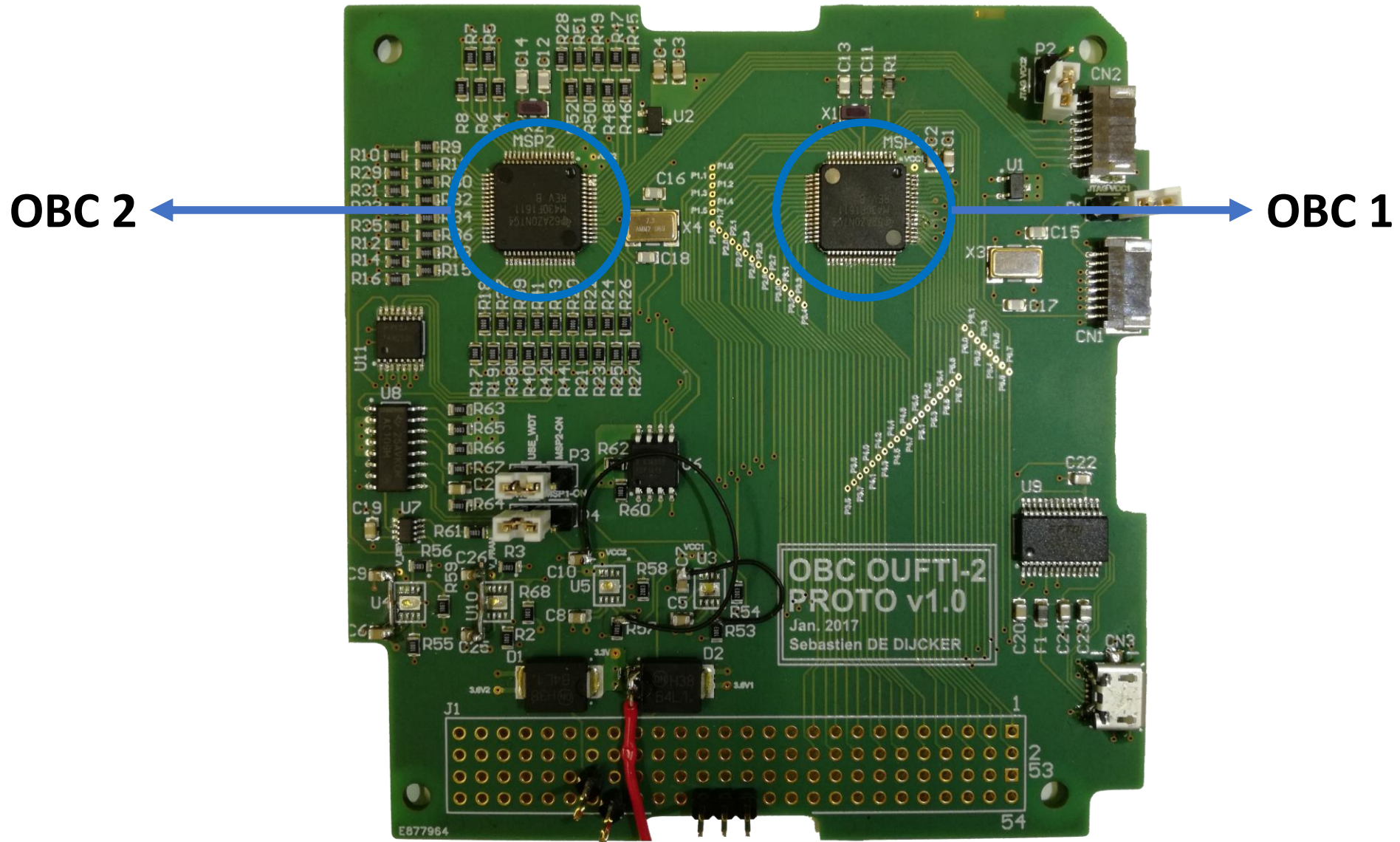


# OUFTI-2: hardware architecture



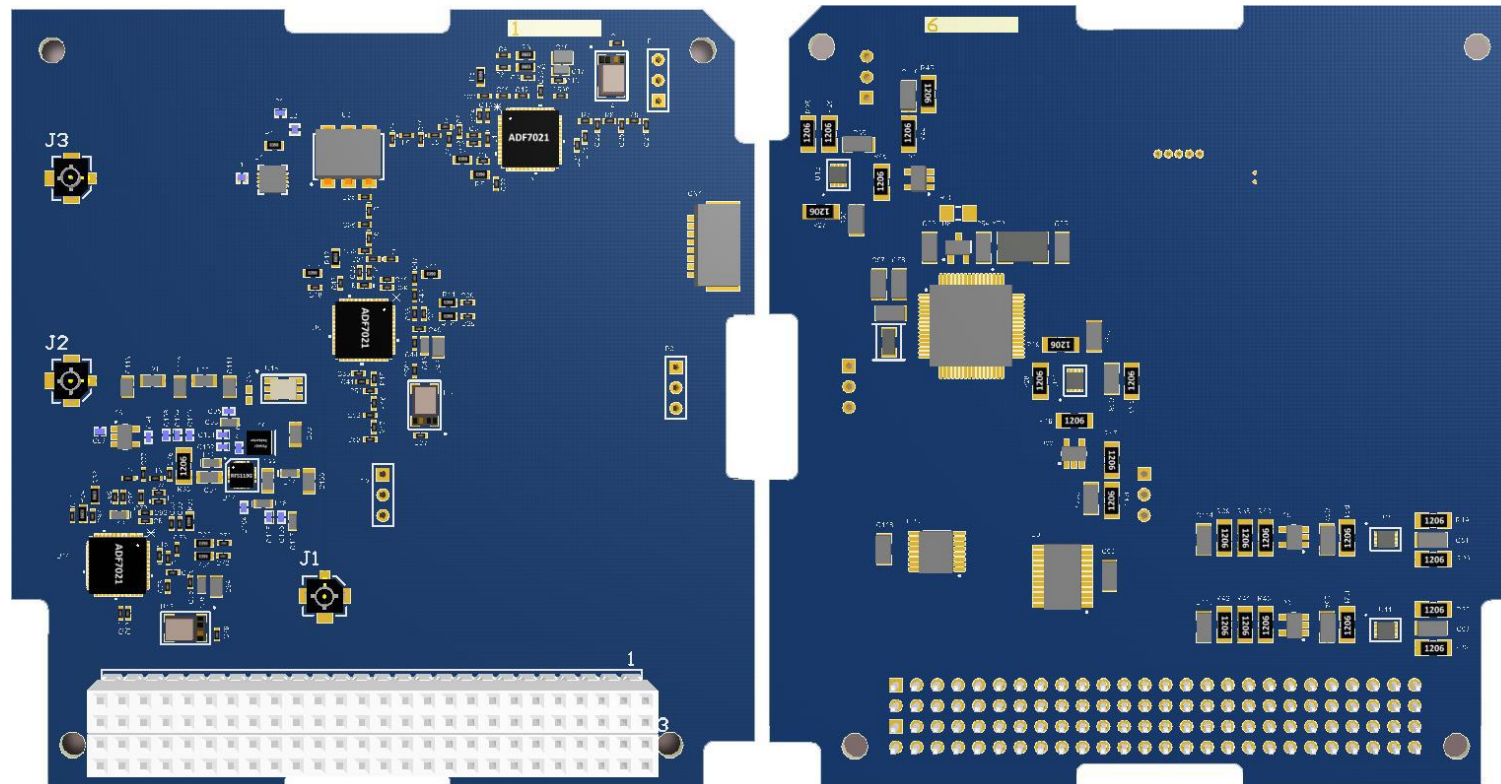
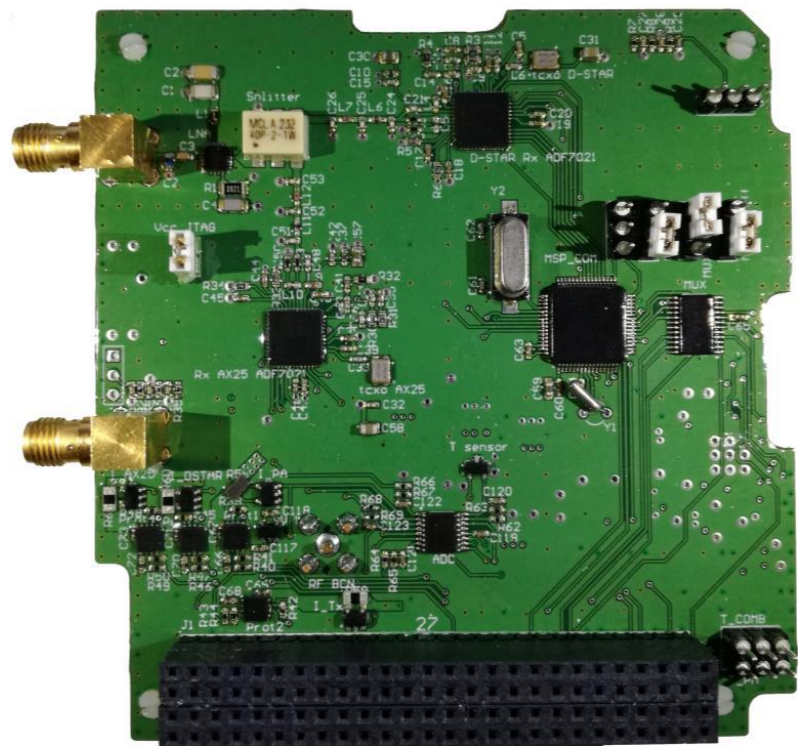
**Let's take  
a photo tour of  
OUFTI-2  
CubeSat !**

# On-board computer (OBC): OBC1 & OBC2

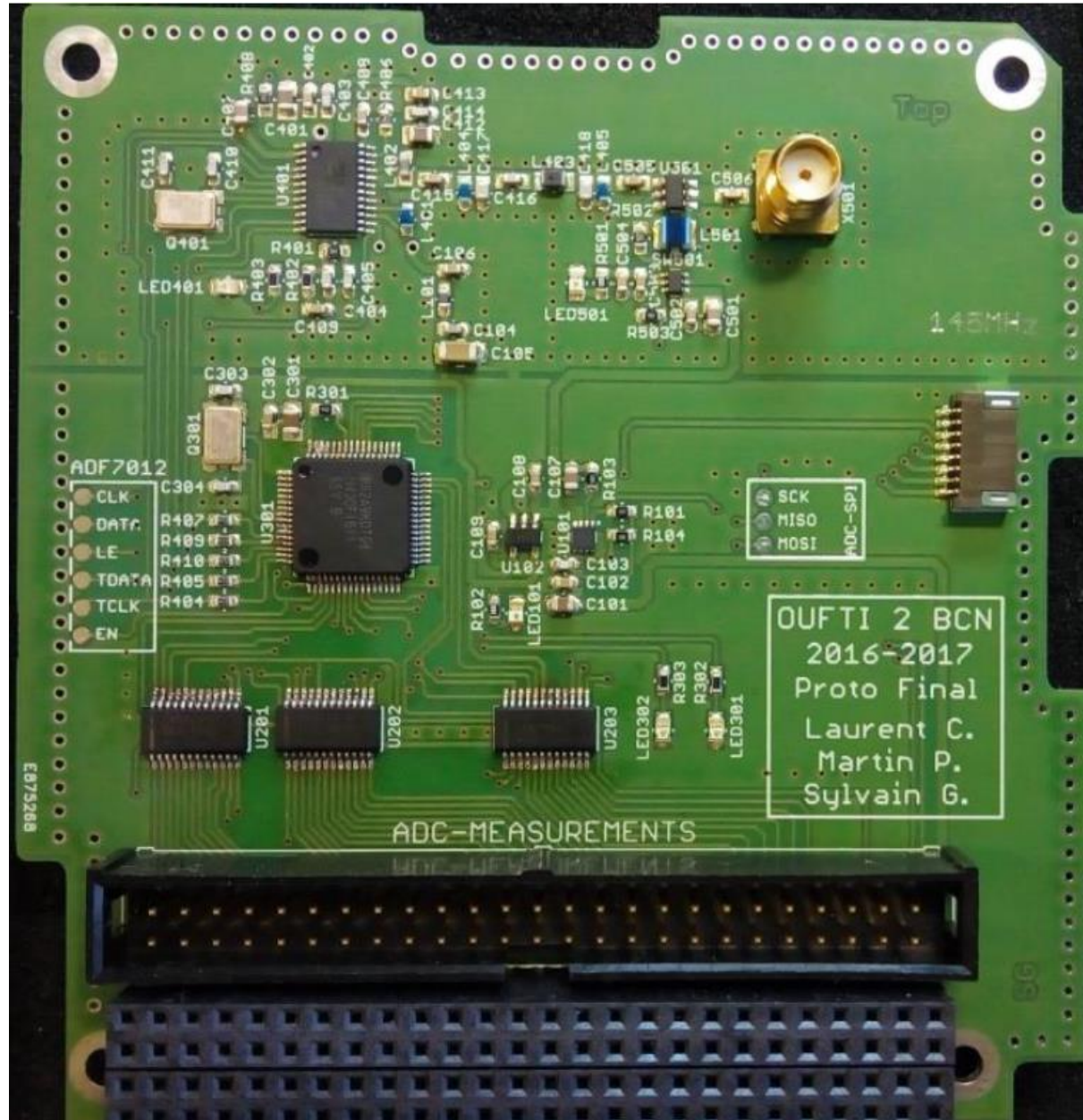




# Communication (COM): AX.25, D-STAR, RF-IN, RF-OUT



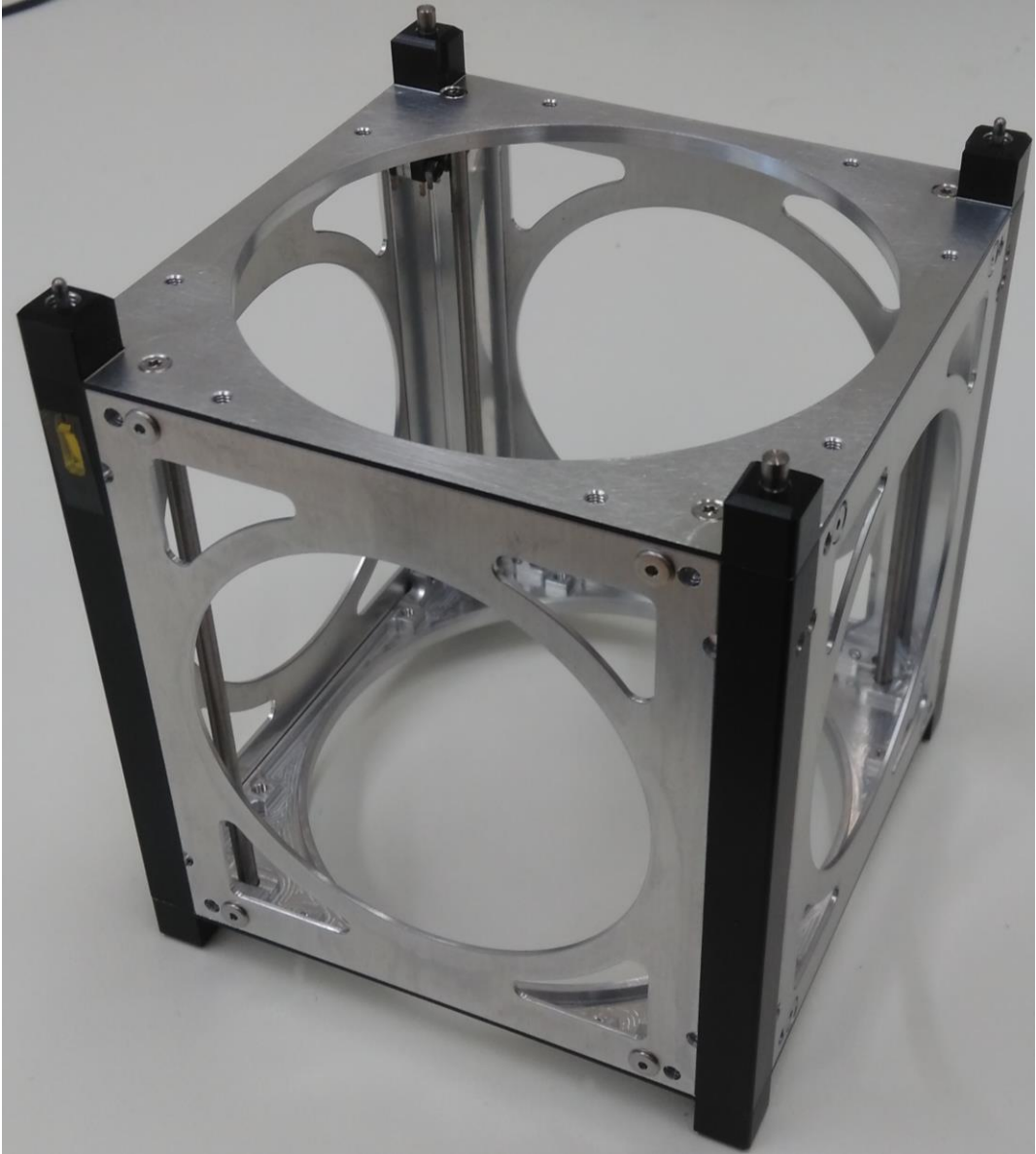
# Communication (COM): BCN



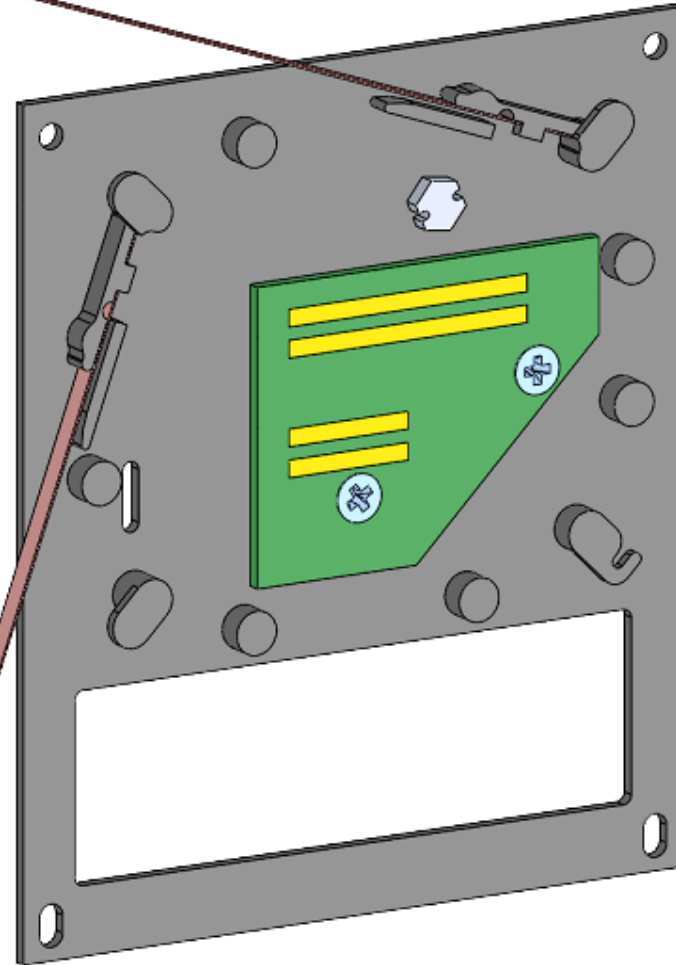
# Batteries



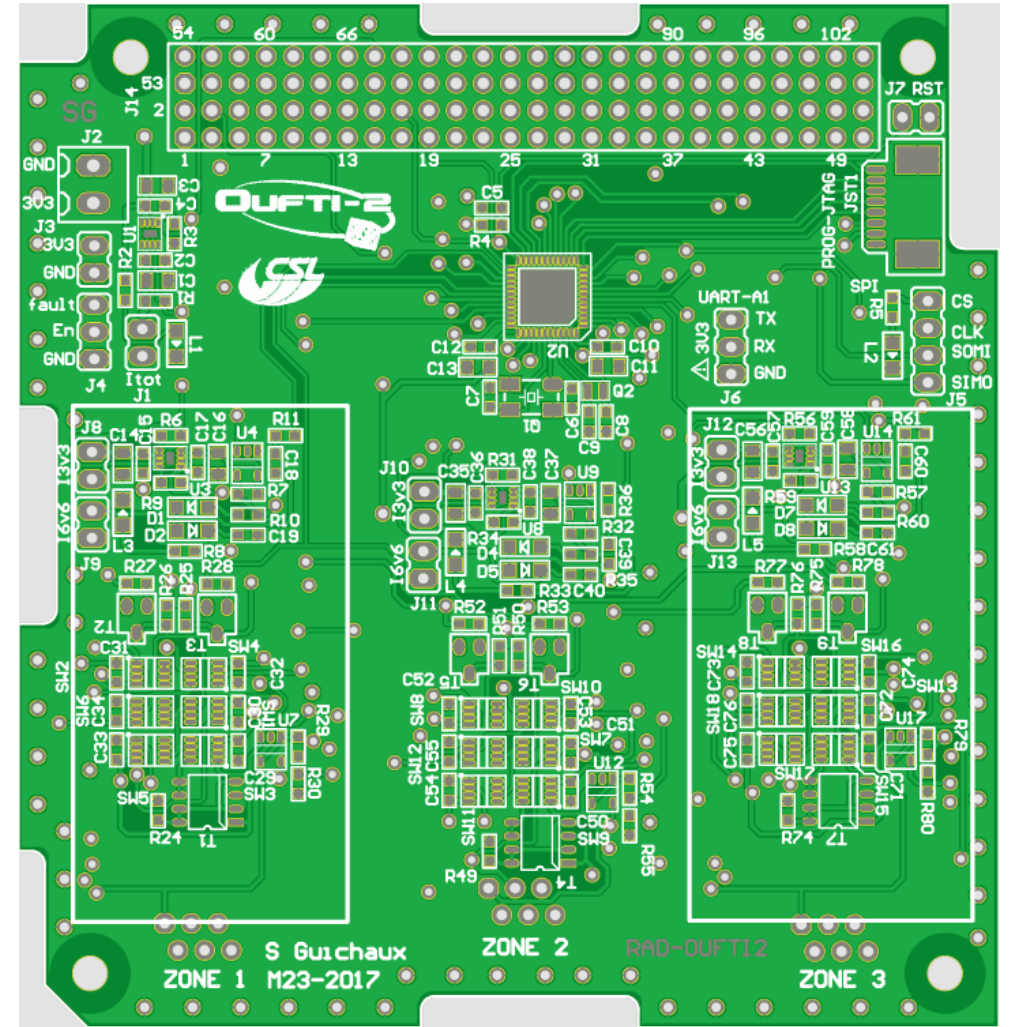
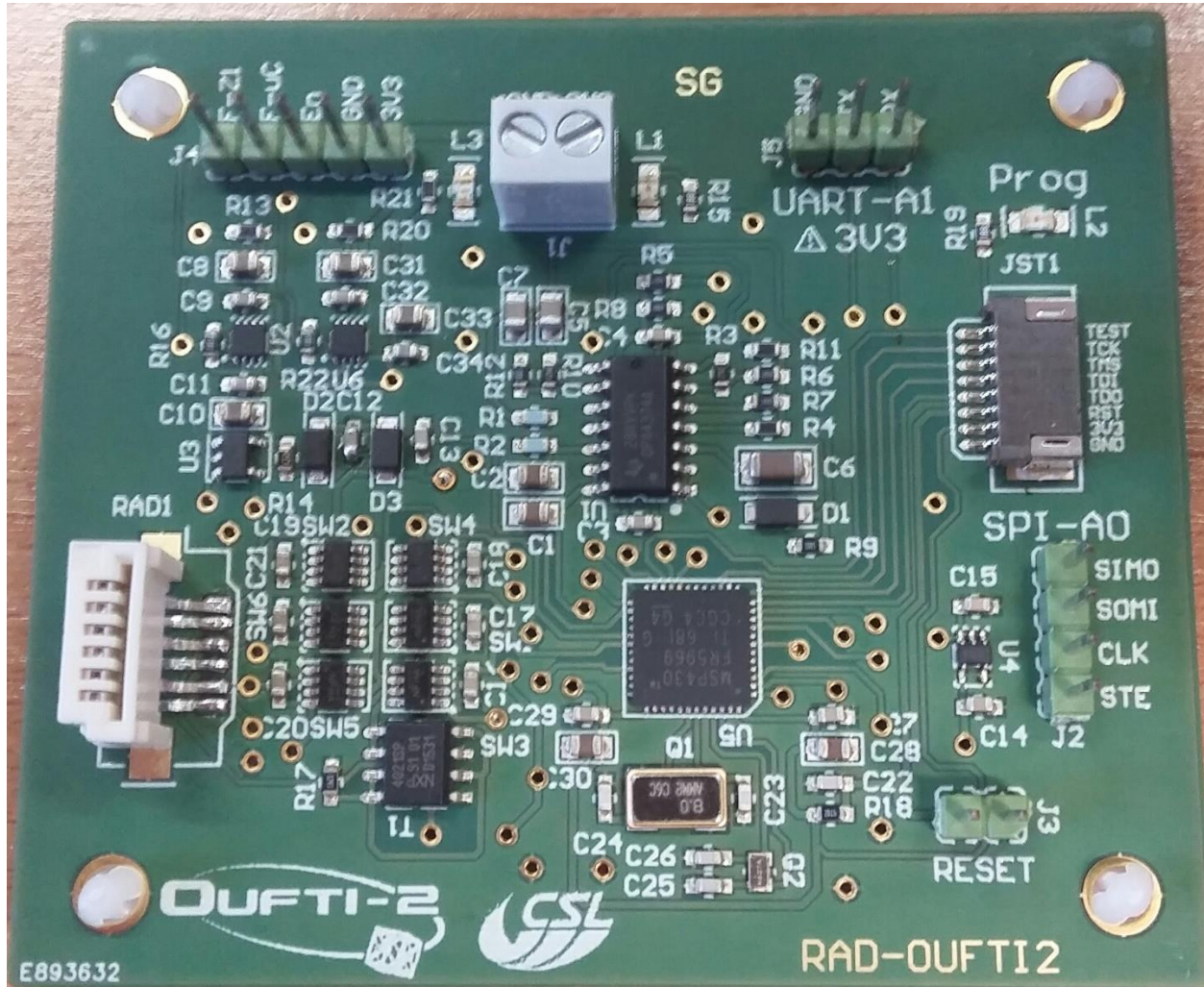
# Structure (STRU) & solar panels



# Mechanical systems (MECH): antennas deployment system



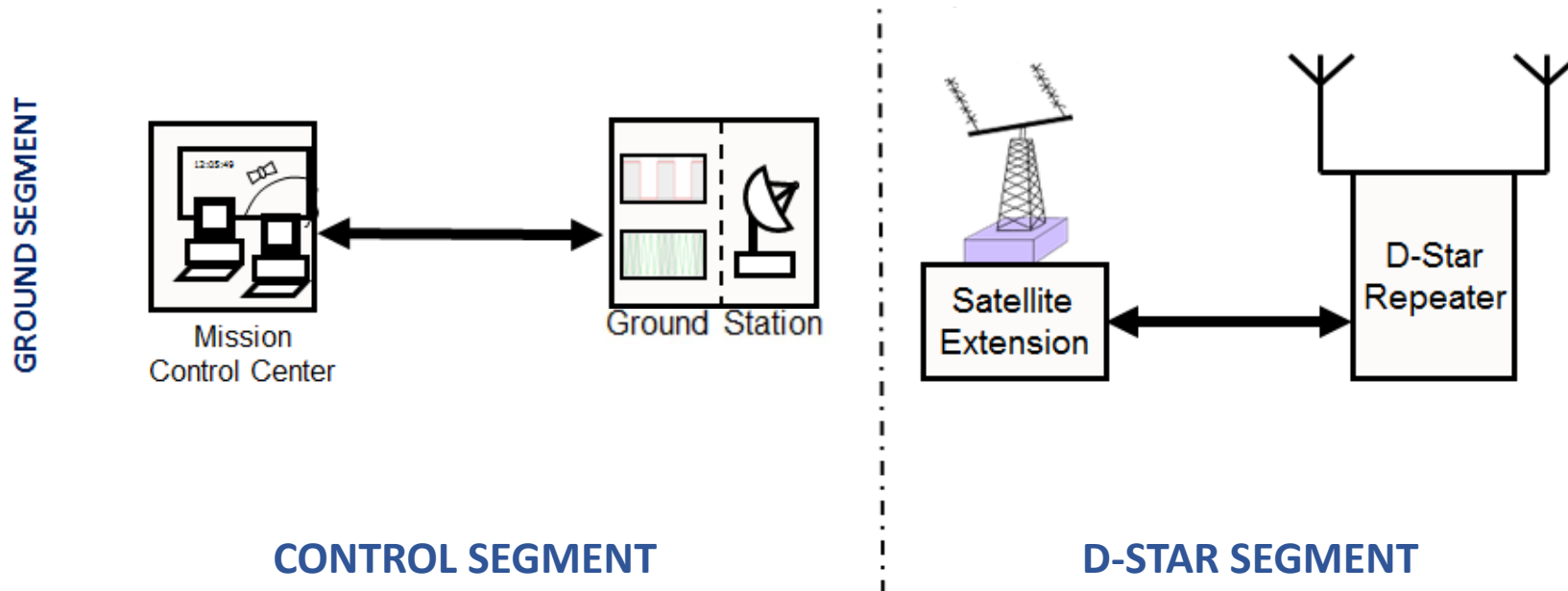
# First secondary payload: RAD



# OUFTI-2: construction status

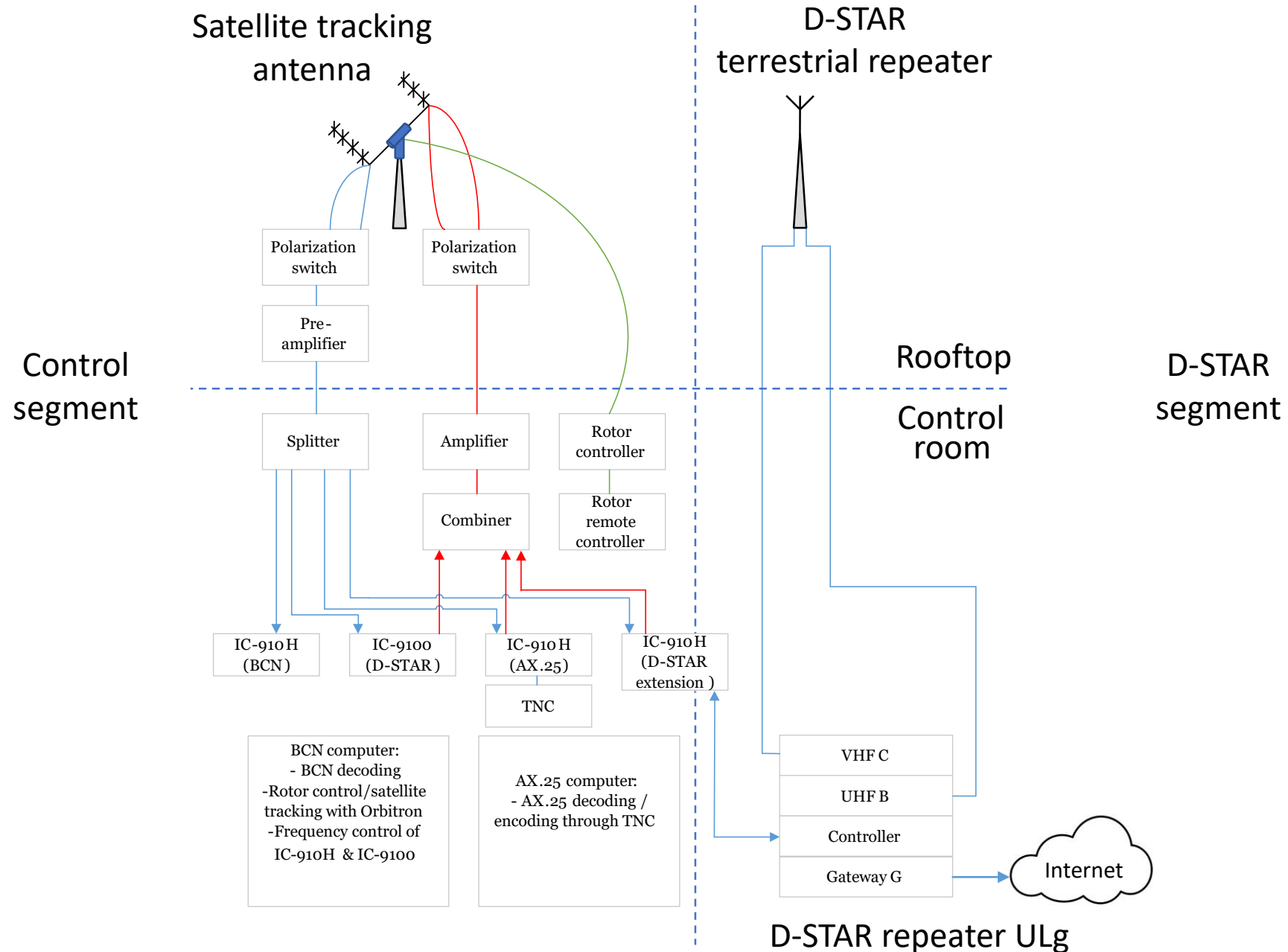
SUBSYSTEMS	STATUS
EPS	Design on going
OBC (OBC1 & OBC2)	To be produced
COM: AX.25	To be produced
COM: D-STAR (primary payload)	Designed and tested
COM: BCN	Designed and tested
COM: RF-IN	To be produced
COM: RF-OUT	To be produced
Solar panels	Delivered
Batteries	Delivered
RAD (secondary payload 1)	Designed. Tests on going
IMU (secondary payload 2)	Design on going
MECH	To be produced
STRU	Delivered
ADCS	Delivered

# Ground segment

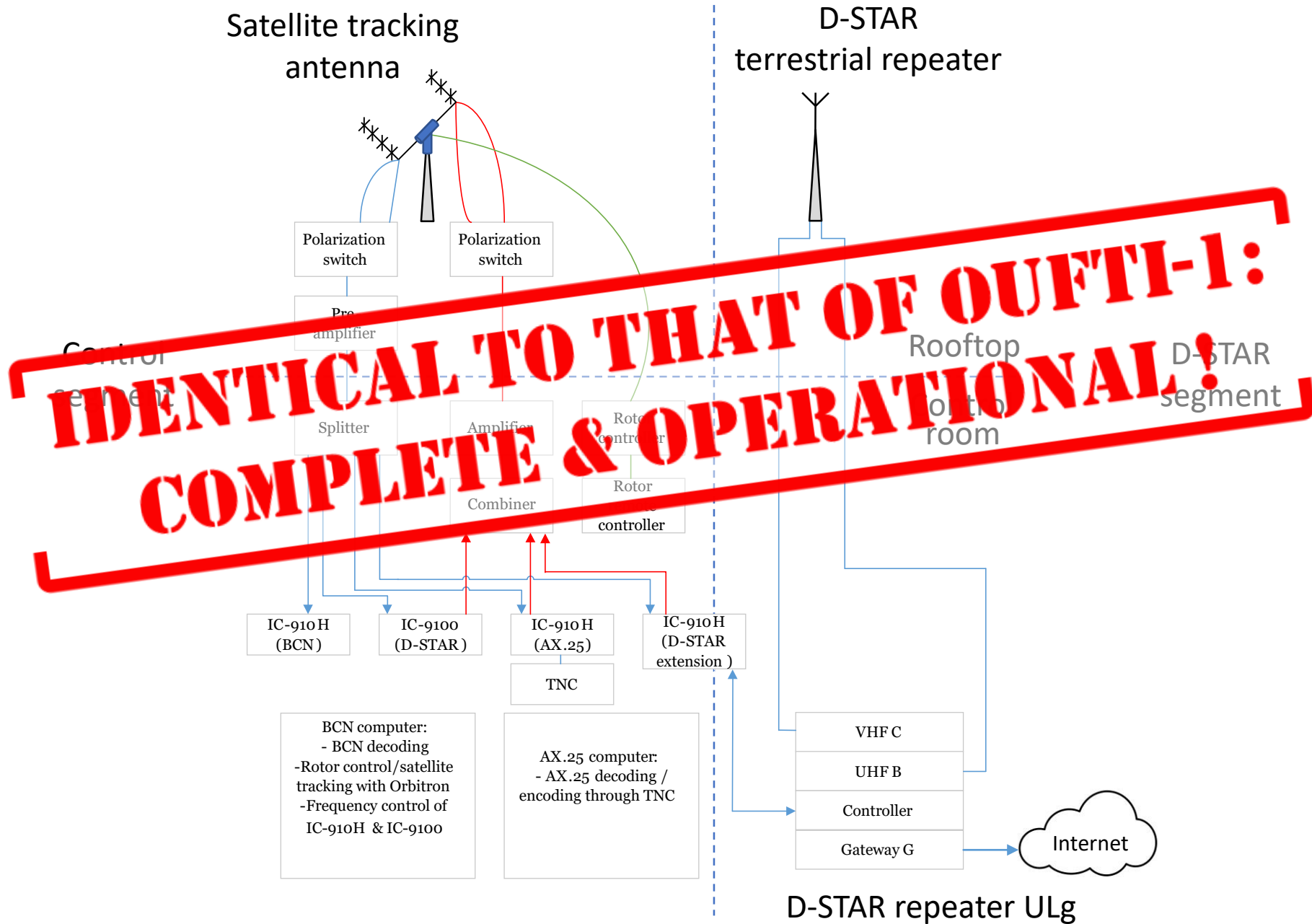




# Ground segment: hardware architecture



# Ground segment: construction status



**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

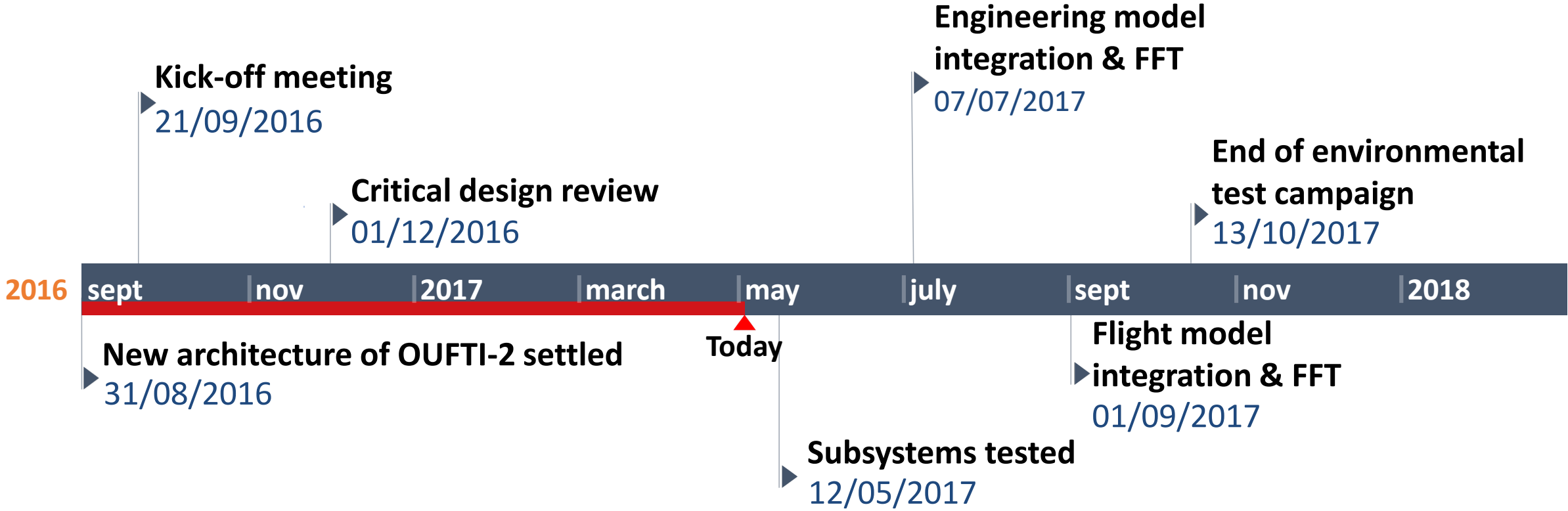


# **Organization & management**

# Integration facility: Centre Spatial de Liège (CSL)

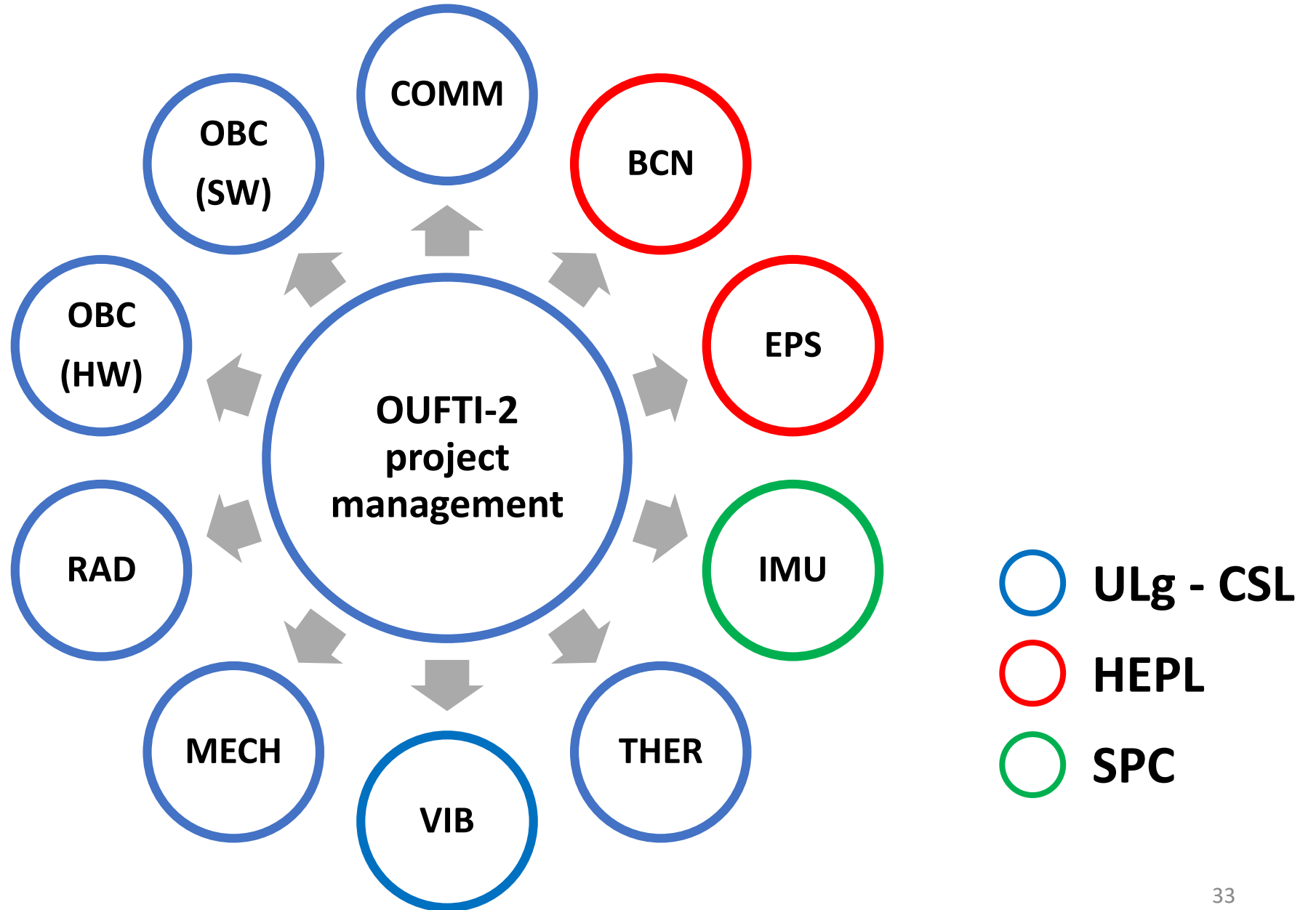


# Timeline & milestones





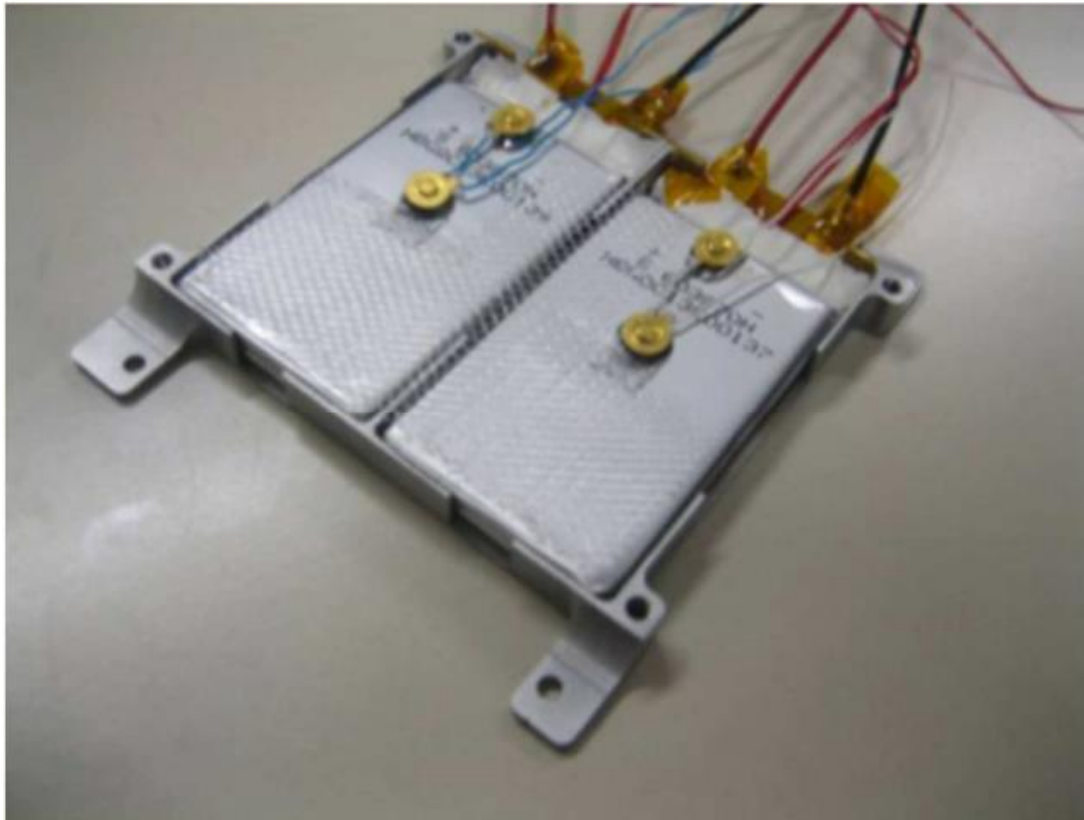
# Project management & work distribution



# Major no-compliances with FYS Design Specification v2.0

**None.**

**However, question about ISS compliance of batteries**



# Why “Fly Your Satellite! 2017” is important to us

- **Continuation of excellent & fruitful interaction with ESA Education Office started with 1st FYS program and OUFTI-1**
- **Excellent opportunity to provide hands-on education & training to students at University of Liège & other institutions of higher learning in Liège area**
- **Access to**
  - **expertise of experts at ESA**
  - **test facilities at ESA (ESTEC & REDU)**
  - **launch opportunities**
  - **help in critical situations (frequencies coordination,...)**
- **Students & supervisors thoroughly enjoyed the first FYS program, and the new team wishes to repeat the experience!**

**Thank you  
for your attention!**

# OUFTI-2



The logo for OUFTI-2 features the text 'OUFTI-2' in a bold, blue, sans-serif font. A thick, dark blue curved line arches over the text, starting from the top of the 'O' and ending at the top of the '2'. Below the text, another thick, dark blue curved line arches under it, starting from the bottom of the 'O' and ending at the bottom of the '2'. At the end of the bottom line, there is a blue 3D wireframe cube with a complex internal structure, resembling a lattice or a mechanical component.