

Independent Promotion of Young Talents in Satellite Development on the Full-Scale Satellite Mission SOURCE

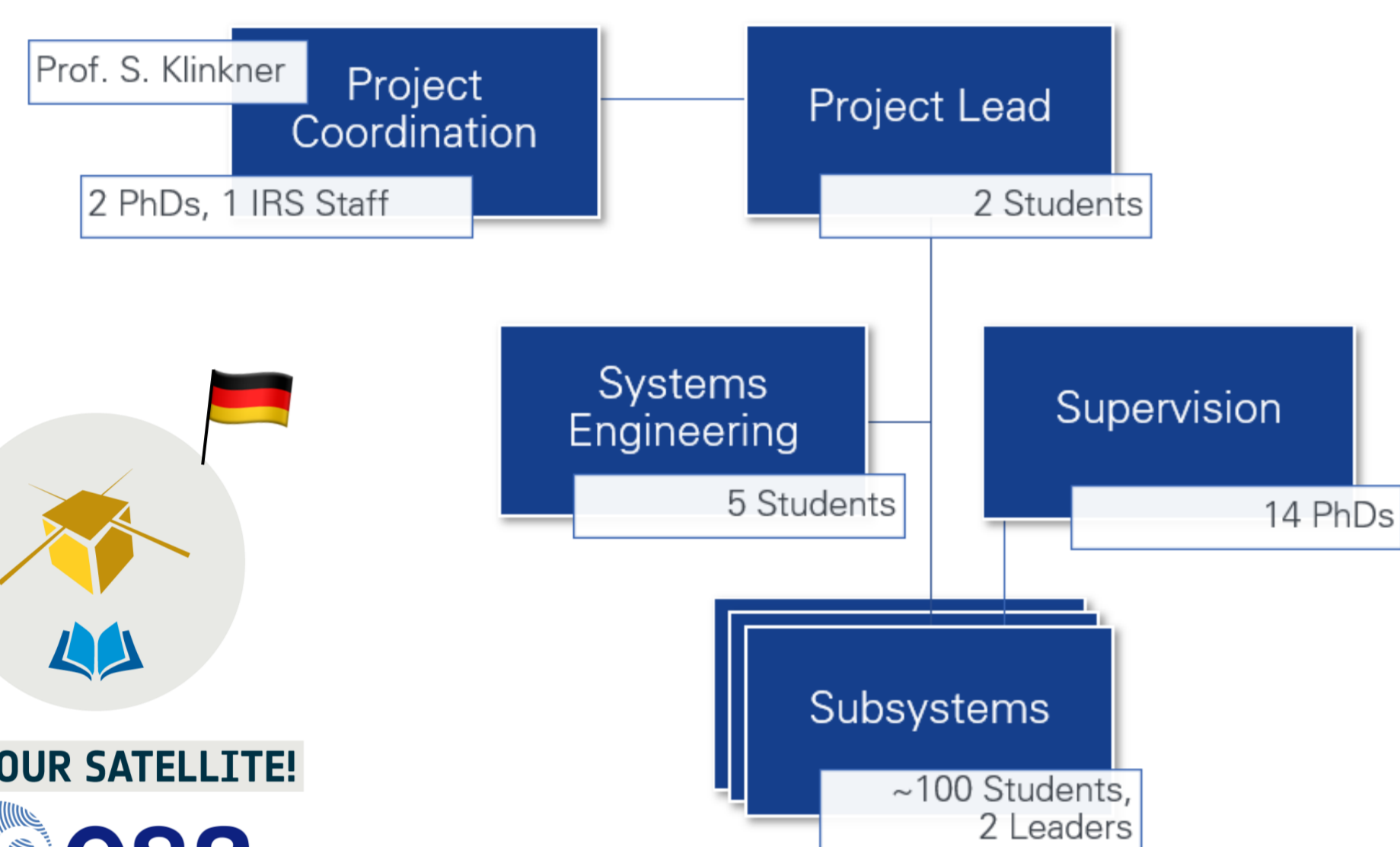
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Hands-On Education

The SOURCE mission is the first student satellite developed at the University of Stuttgart. This unique opportunity for undergraduate and graduate students is made possible by the cooperation between the Institute of Space Systems (IRS) and the Small Satellite Student Society (KSat e.V.)

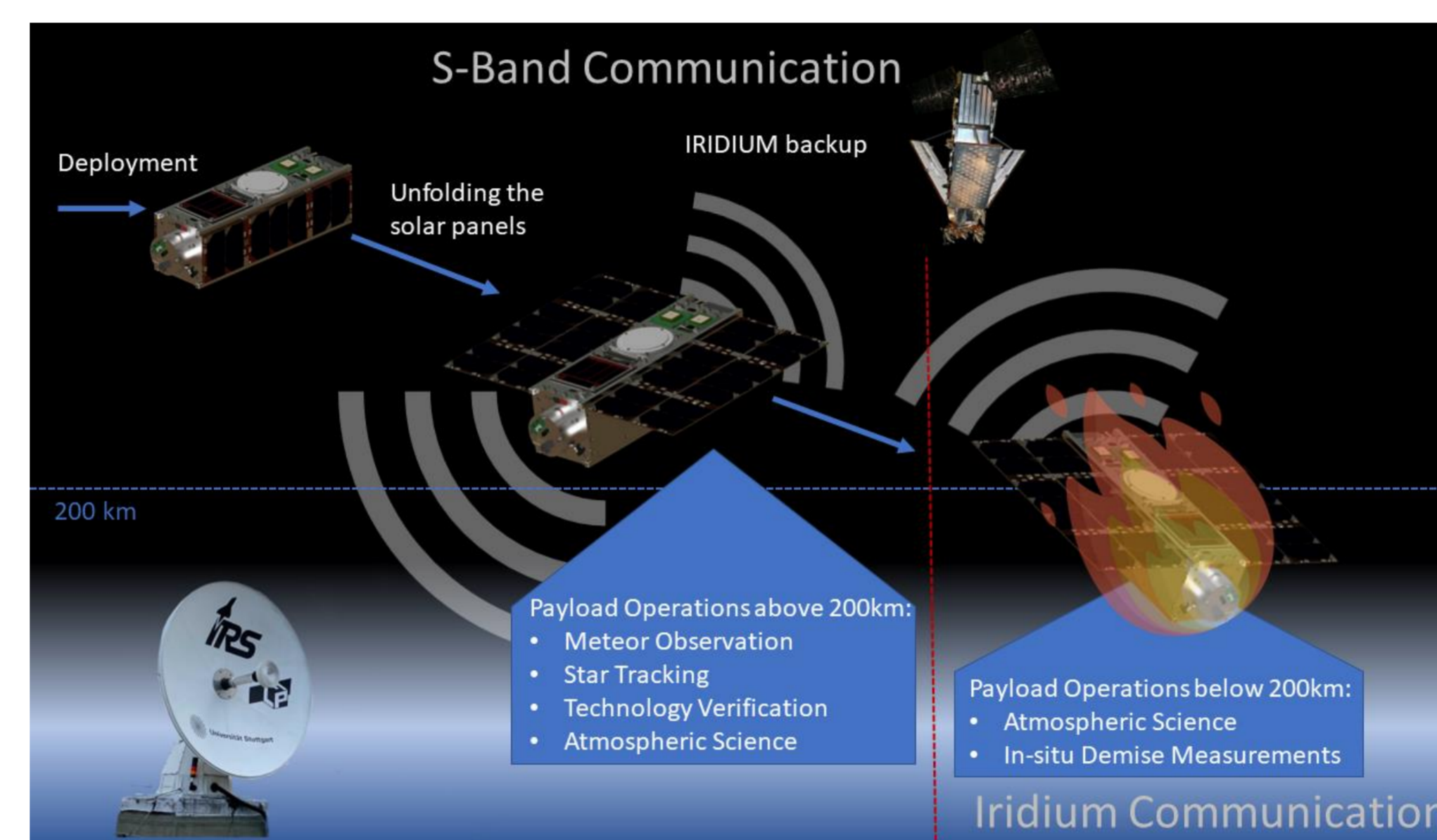


- Over 100 active students
- Voluntarily or as lecture for one semester
- Student taught courses
- So far, more than 350 participants

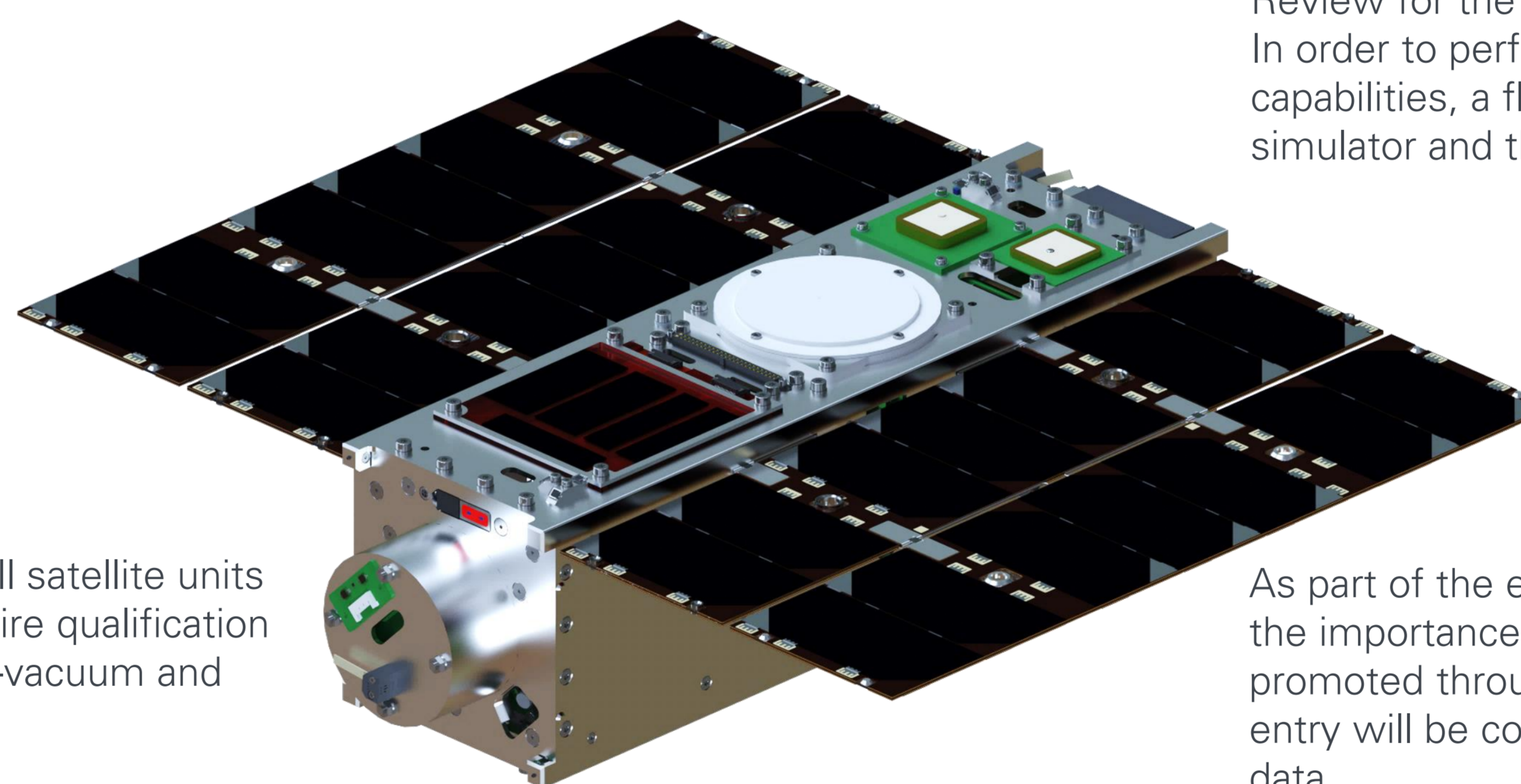


FLY YOUR SATELLITE!
esa

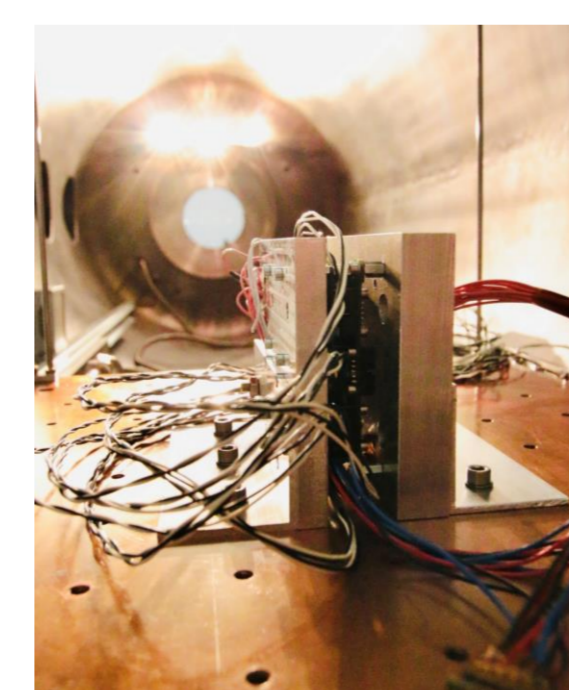
- 1st German team to join
- Expert knowledge
- Test facilities
- Reviews



SOURCE Mission Scenario



SOURCE CubeSat



TVAC Test

Satellite Test Campaign

A major task during phase D development is the environmental testing of all satellite units and the system. As SOURCE includes many in-house developments an entire qualification model was built. In order to satisfy project and ESA requirements, Thermal-vacuum and vibration testing is based on the ECSS standard.

TVAC Test:

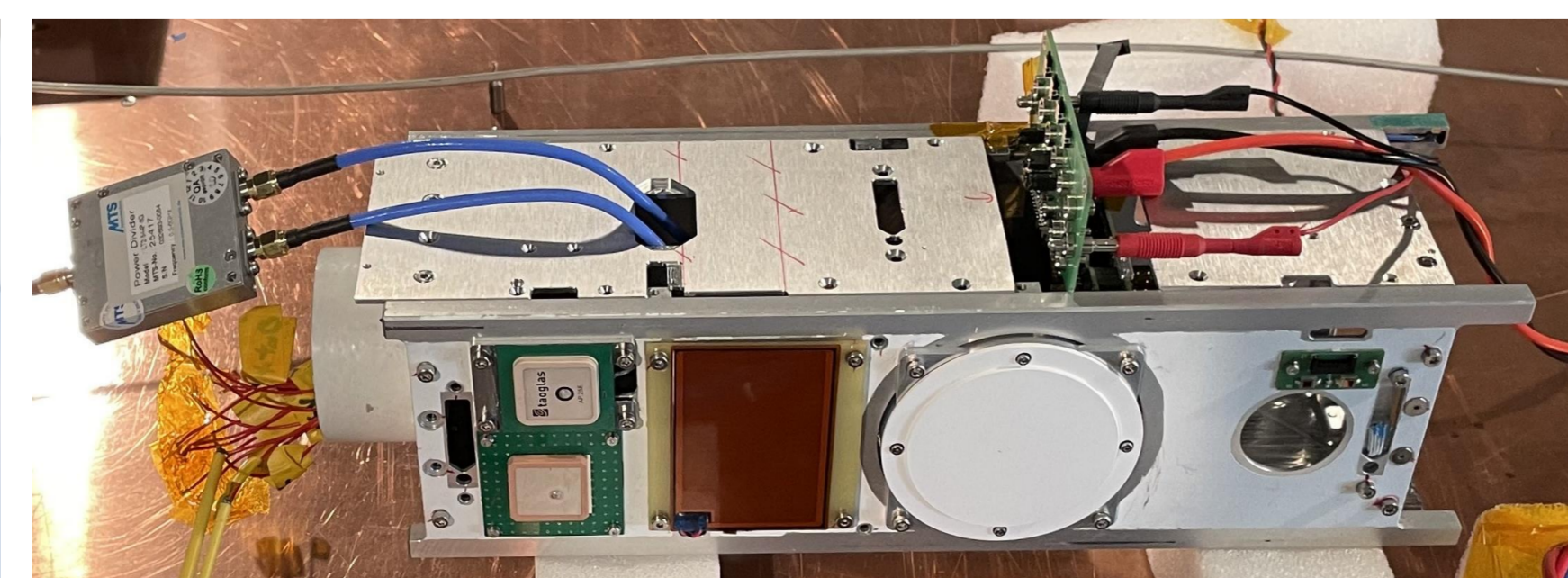
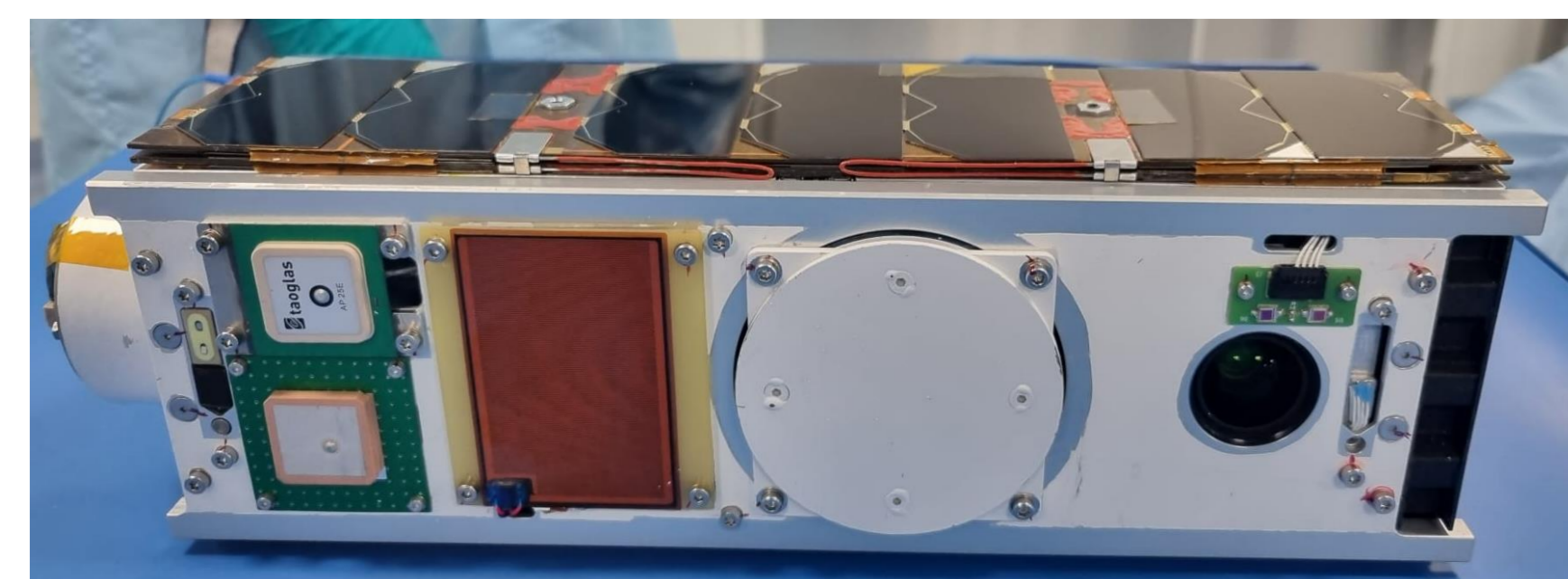
- ESATAN simulation, verified by thermal model
- QMs allow for testing up to maximum temperature limits
- Adaptation of ECSS standard to outline clear testing setup, schedule and limits
- Resulting SOURCE Testing Reference Standard written by students, approved by ESA

Vibrations Test:

- QM carrying all in-house developed units and dummies of the battery, S-Band Transceiver, antenna and OBC
- Loads based on worst case of various launchers
- Three axis for quasi static and random vibrations

EMC Test:

- PCDU
- PCBs susceptible to EMC emission or interference of on-board coms



SOURCE Shaker Model (left) & EMC test (right)

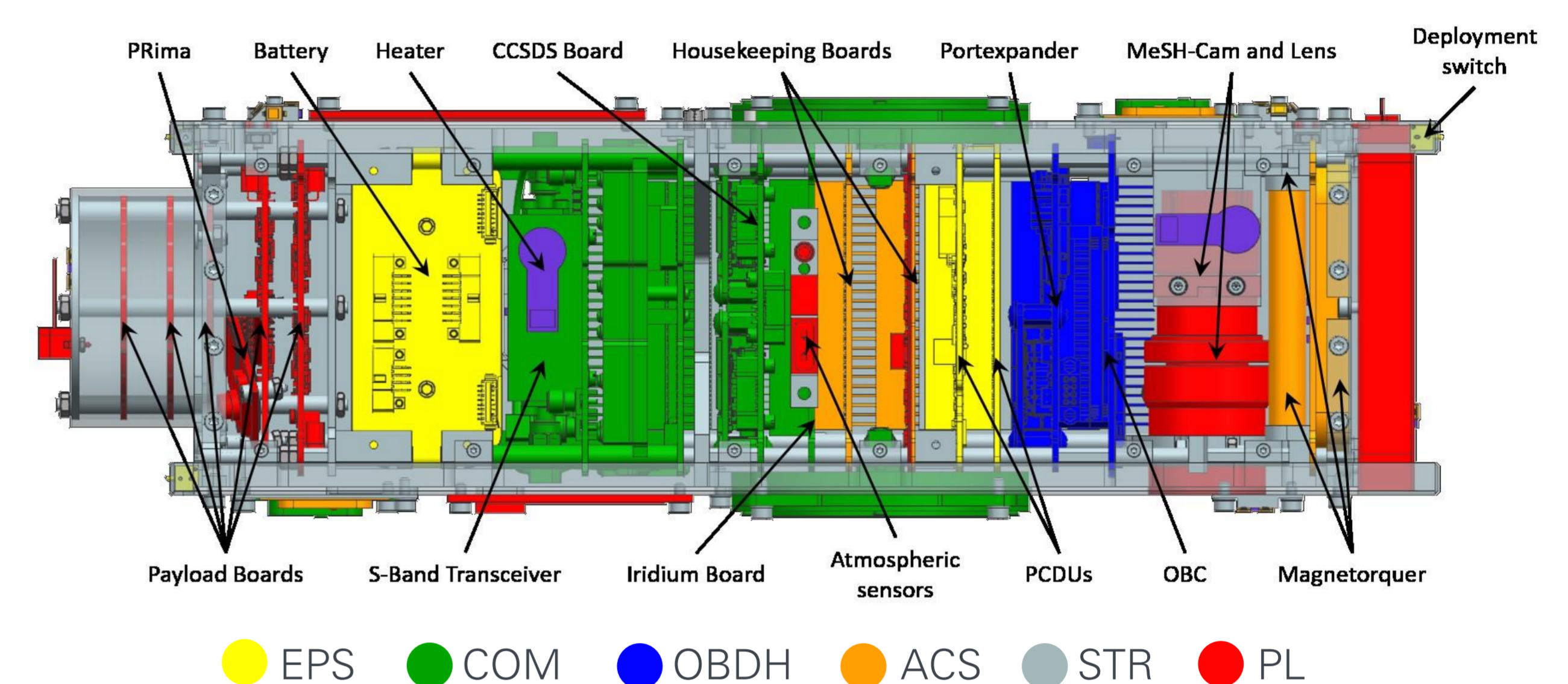
SOURCE CubeSat

Stuttgart Operated University Research CubeSat for Evaluation and Education

Mission Objectives

3U+ CubeSat – 36 cm x 10 cm x 10 cm – 4.3 kg

Education – Technology Verification – Meteor Observation – Re-Entry Science

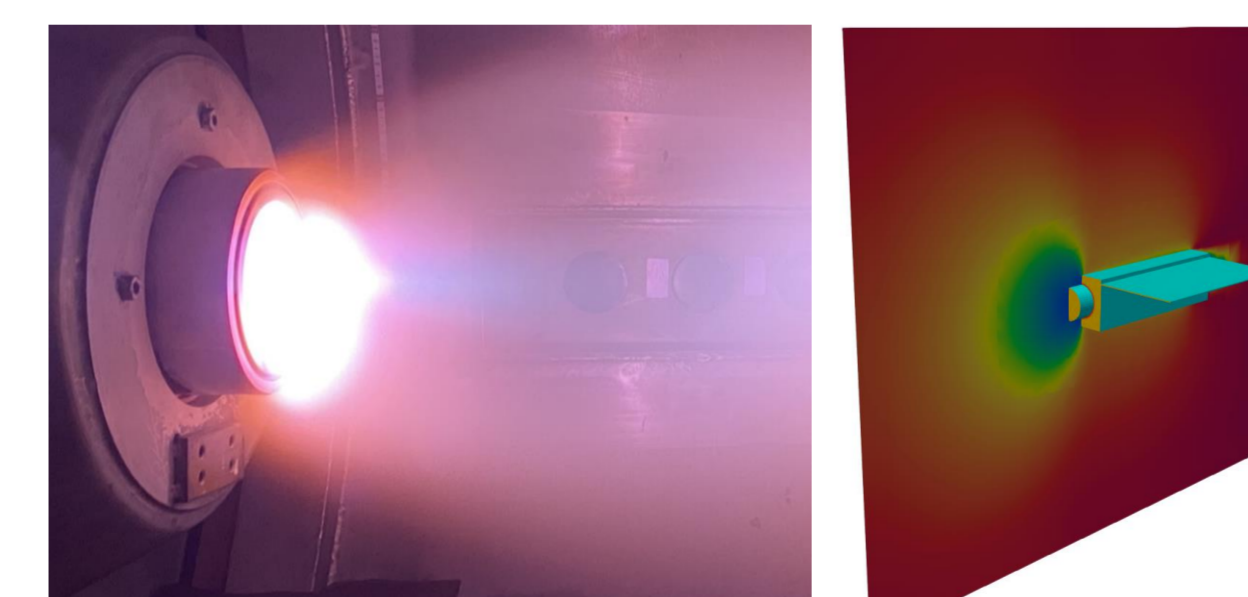


To achieve the goal of education, 13 in-house developed PCBs are included in SOURCE. These range from the PCDU across other mission critical units such as the ACS, data handling system, main structure, solar panel structure with hold down and release mechanism to the payload processing units.

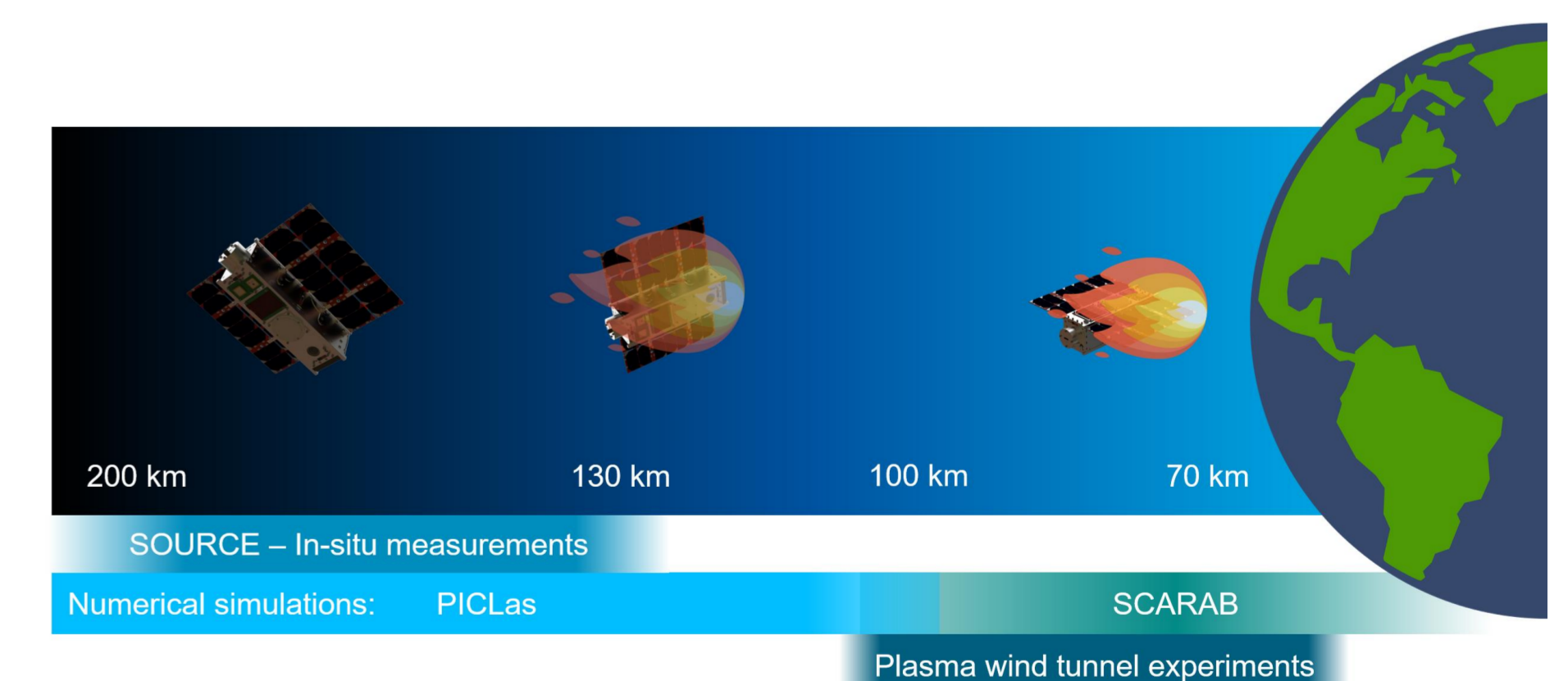
Currently, the environmental test campaign of the full qualification model is close to completion and will conclude with the Manufacturing Readiness Review for the Flight Model under supervision of ESA. In order to perform system functional tests and improve software development capabilities, a flat sat is set up which is tied into the spacecraft simulator and the ground station.

Clean Space Research

As part of the education of the next generation spacecraft engineers the importance of a clean-space mindset upon designing a mission is promoted through the SOURCE project. The data is gathered upon re-entry will be compared to simulation and plasma wind tunnel test data.



Plasma Wind Tunnel & PICLas Simulation



Lessons Learned

- A clear and easy to follow on-/off boarding process is essential in a dynamic university environment to preserve knowledge and to quickly integrate new team members
- Combining theoretical knowledge obtained in lectures with hands-on experience under the mentorship of qualified PhDs provides students with a significant advantage for their future careers
- In-house developments are time consuming, require rigorous testing but provide valuable technical advantages as well as great educational experiences
- Including harness, especially the connectors in the CAD and scheduling additional time during integration for routing is highly encouraged
- Promoting the cross-subsystem exchange of challenges and solutions prevents from work being done twice and results in tools and processes benefiting the whole team