A Nanosatellite Mission for Altimetry and Dosimetry

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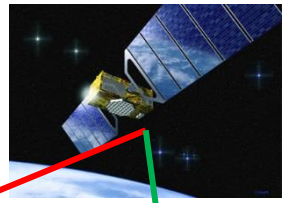
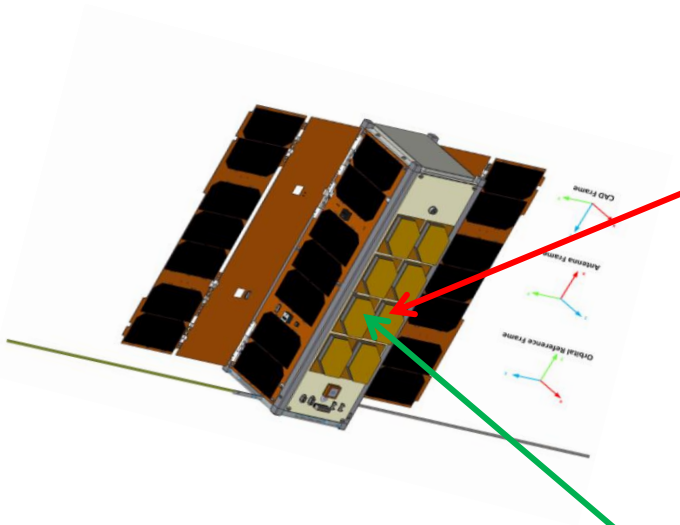
Introduction

- RUAG Space Austria and TU Graz: study of passive reflectometry (Austrian national Space program)
- Proposal for an Austrian CubeSat to ESA‘s GSTP: PRETTY (Passive REflecTometry and DosimeTrY)
- Seibersdorf Laboratories joined, dosimetry development
- 3U CubeSat with powerful processor and SDR front-end
- Phase A/B completed, Phase C/D/E in progress
- Launch in Q3/2022 into 550 km LEO orbit

Passive Reflectometry



GNSS satellite



Earth

Scatterometry:
measure reflections from Earth's surface for different delay &Doppler values

Altimetry:
Determination of relative delays between direct/reflected signal

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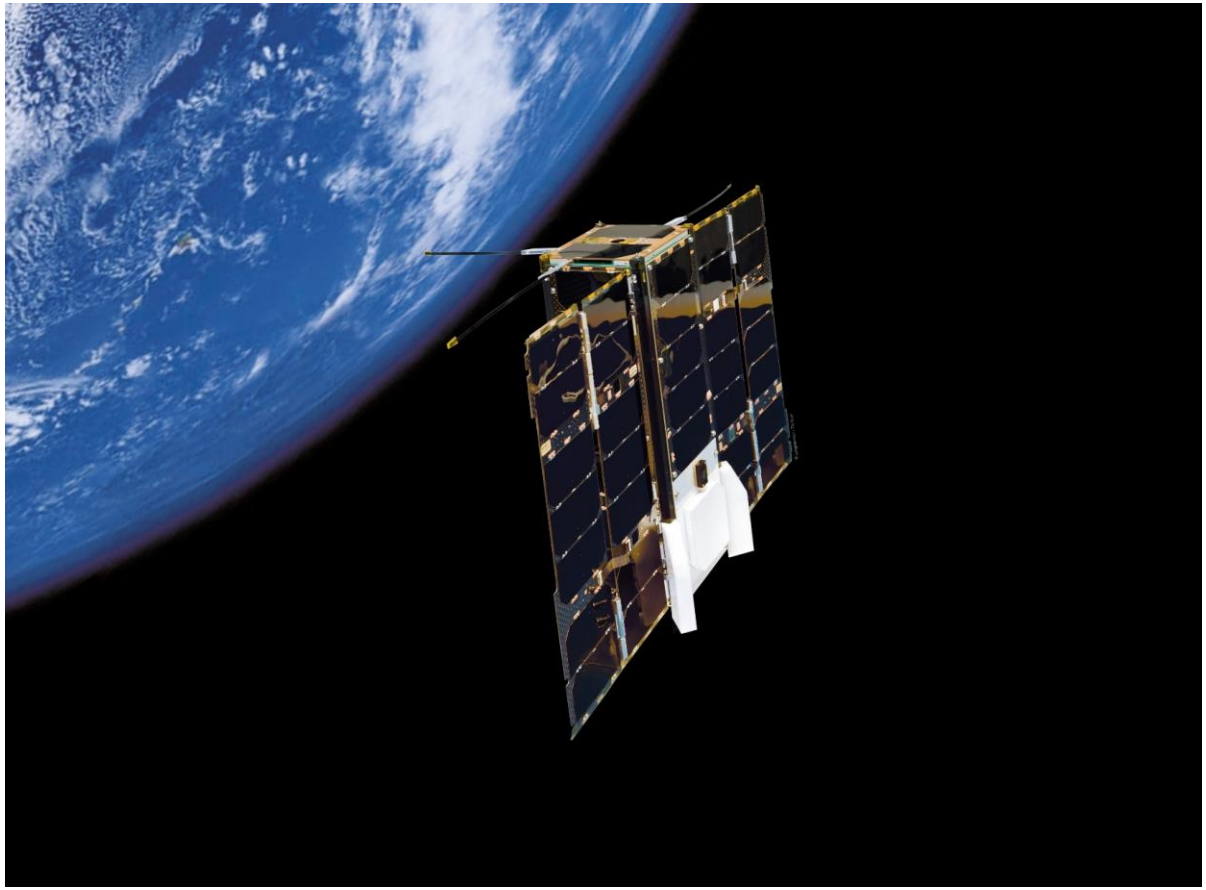
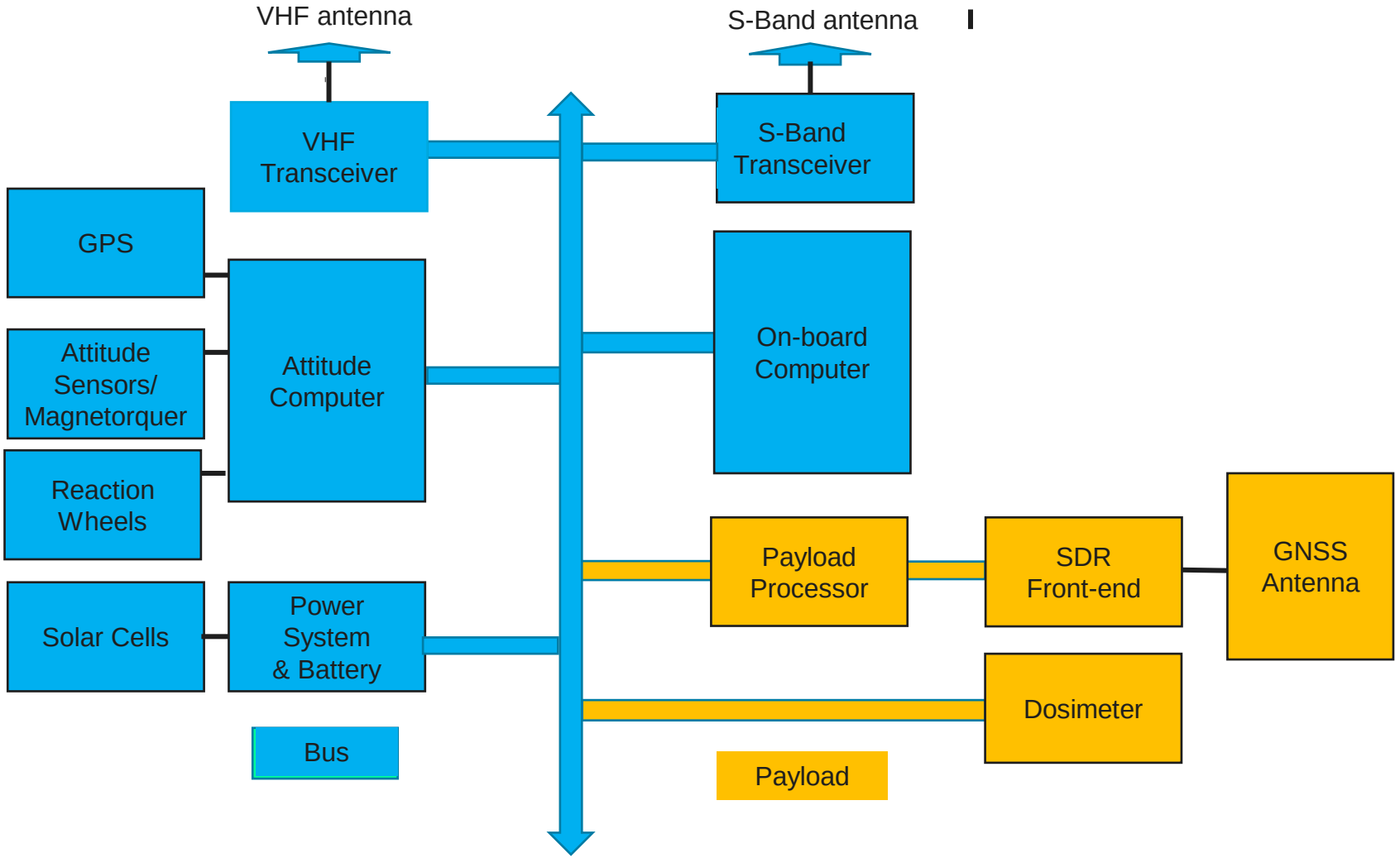
OPS-SAT Nanosatellite Mission

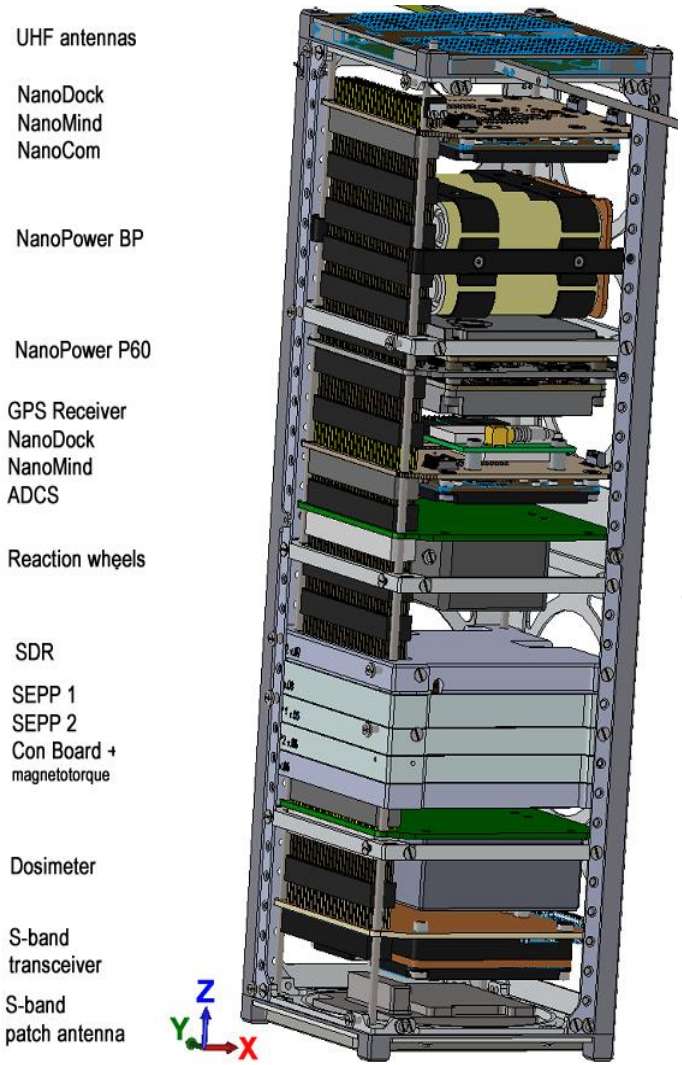


Satellite bus of PRETTY based on design of ESA‘s OPS-SAT technology satellite
Launched in Dec. 2019, successful operations since then

System Design



System Design (2)



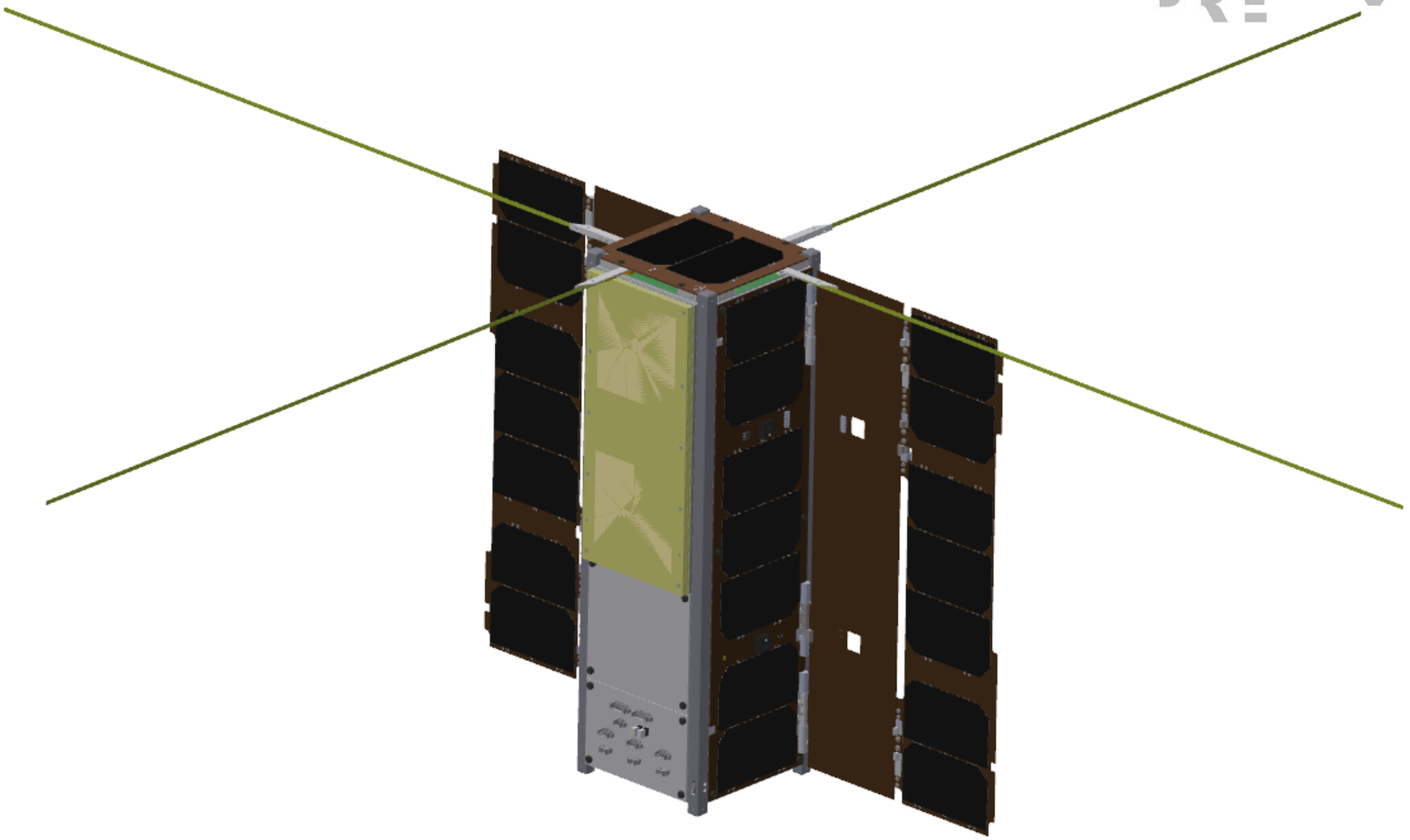
Satellite Bus: flight-proven subsystems

Software-defined

radio & payload processor:

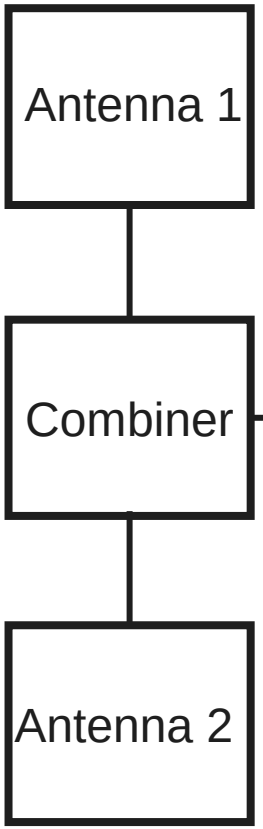
flight heritage from OPS-SAT mission

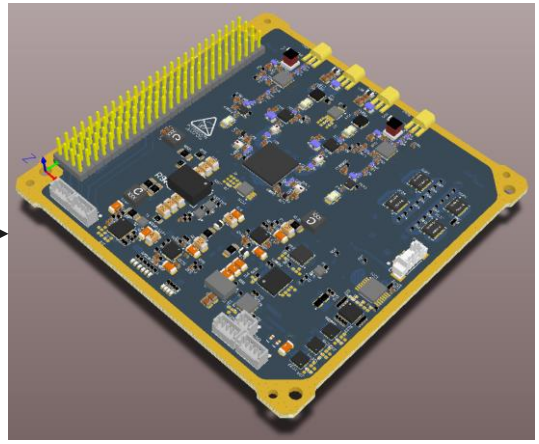
System Design (3)



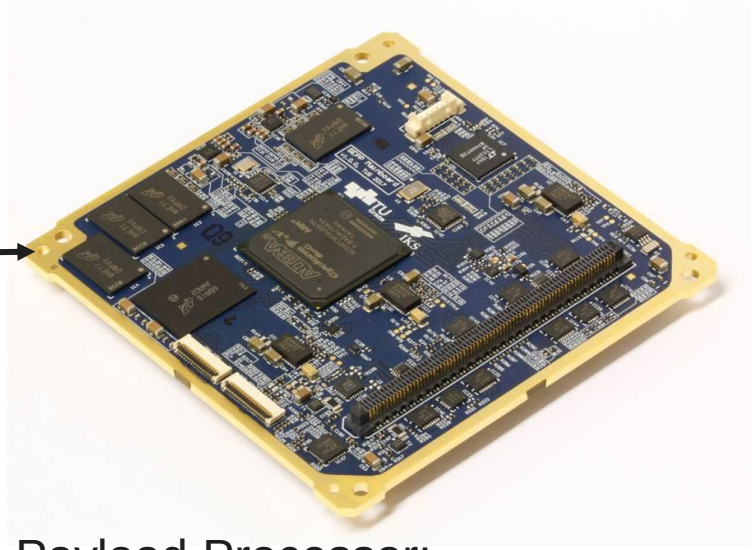
3U CubeSat with deployable solar arrays
24 W power generated

Passive Reflectometer Payload





Software Defined Radio
Front-end: 1176.45 MHz (L5)



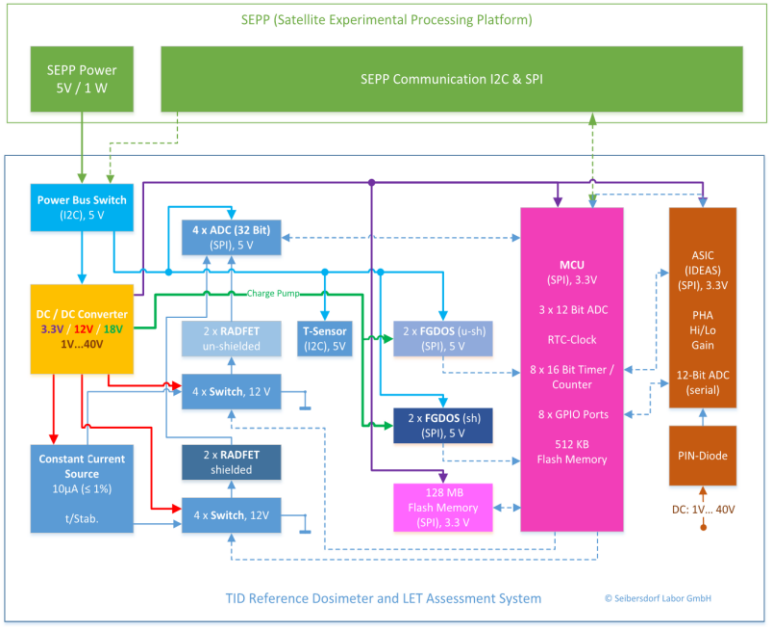
Payload Processor:
System on Module Altera Cyclone V
Memory 1 GB DDR3 RAM (ECC)
8 GB Industrial SD-Cards

Altimeter Ground Tests

Representative tests conducted by RUAG in Vienna

Dosimeter

- Measurement of radiation environment in LEO
- Developed by Seibersdorf Lab.
- Correlation with effects in COTS electronics
- Solid-state radiation sensors RADFET
- Own processor and storage
- Data transfer to payload processor



Ground Station

- S-band and VHF band ground station in Graz
- Operated by TU Graz

Summary

- PRETTY: Passive Reflectometry and Dosimetry mission
- Using 3U CubeSat (heritage from OPS-SAT)
- Powerful processor & SDR front-end
- Altimeter realised, measurement of
  - Sea height
  - Ice cover
- Contribution to climate monitoring
- Investigation of radiation effects on COTS electronics
- PRETTY is fully compliant with Austrian Space Law
  - Frequency coordinated by Radio Regulation Office with ITU
  - Fully Space-Debris compliant
- Phase A, B completed, C/D/E on going under ESA‘s GSTP program
- Launch in Q3/2022

Acknowldegments

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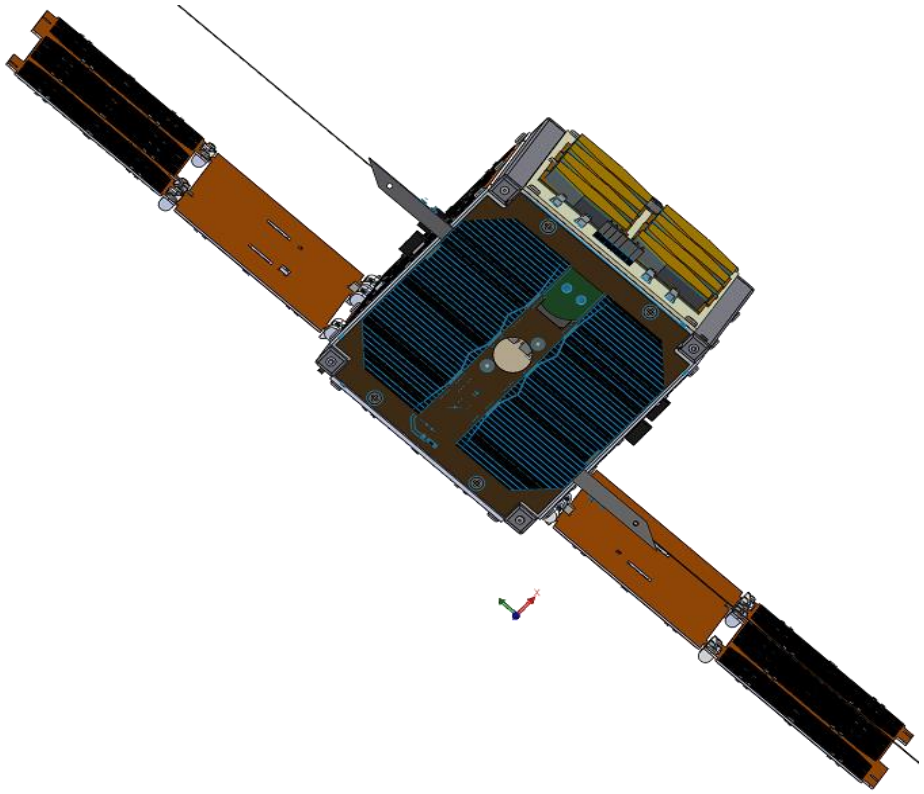

Thank you for your attention!

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