TUMNANOSAT NANOSATELLITE AND KIBOCUBE PROGRAM

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CLGE General Assembly, 17-19 September, 2020, Athens, Greece

Subjects

- TUM Center of space technologies
- UNOOSA and JAXA KiboCUBE Program
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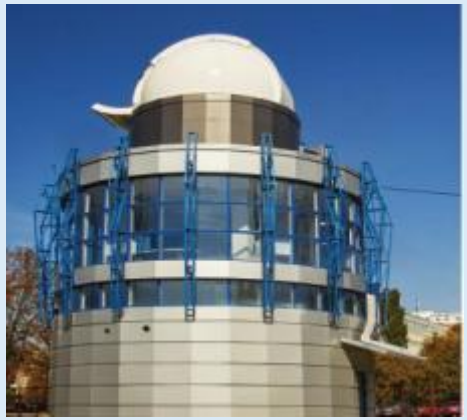
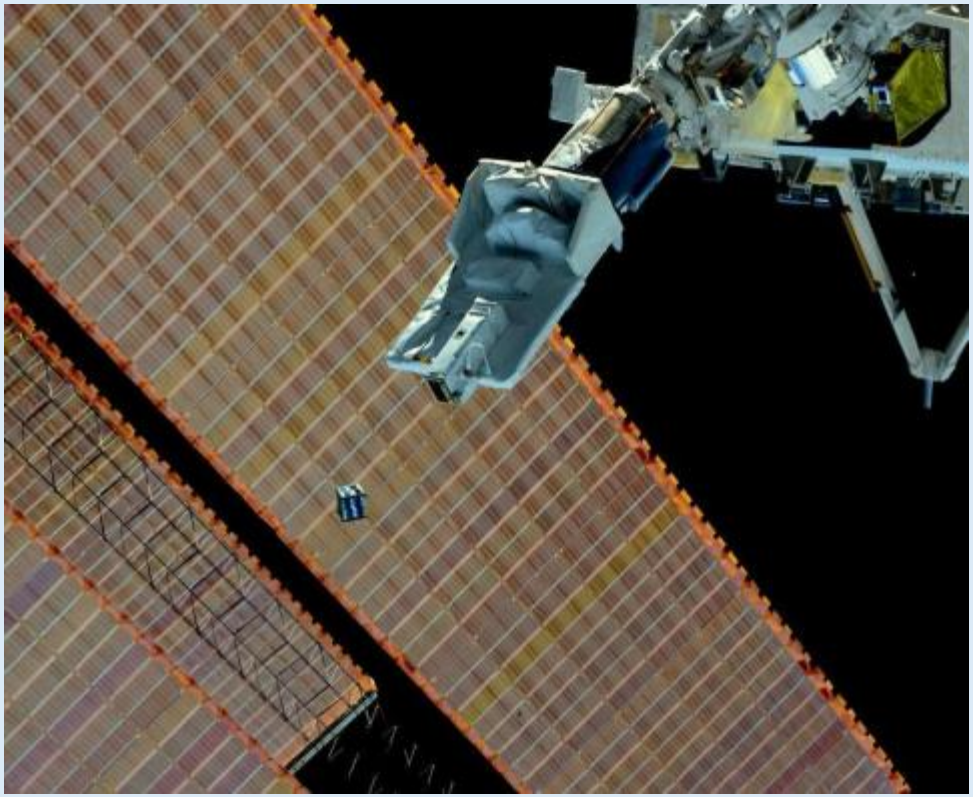
- TUMnanoSAT electrical power system
- TUMnanoSAT - radiation nanosensors
- TUMnanoSAT - image camera
- Satellite communication
- TUMnanoSAT under KiboCUBE Program

TUM Center of Space Technologies

- The only space related research center in Republic of Moldova established in 2012
- 35 people directly involved (PhD, master, license students)
- Over 60 students attended Satellite Communication course
- 6 laboratories
- Astronomic observatory
- 2 fully functional ground stations



UNOOSA and JAXA KiboCUBE program



The United Nations Office for Outer Space Affairs (UNOOSA) and the Japan Aerospace Exploration Agency (JAXA) announce the United Nations/Japan Cooperation Programme on CubeSat Deployment from the International Space Station (ISS) Japanese Experiment Module (Kibo) "KiboCUBE".

TUMnanoSAT in the KiboCube program

Technical University of Moldova

Japan Aerospace Exploration Agency

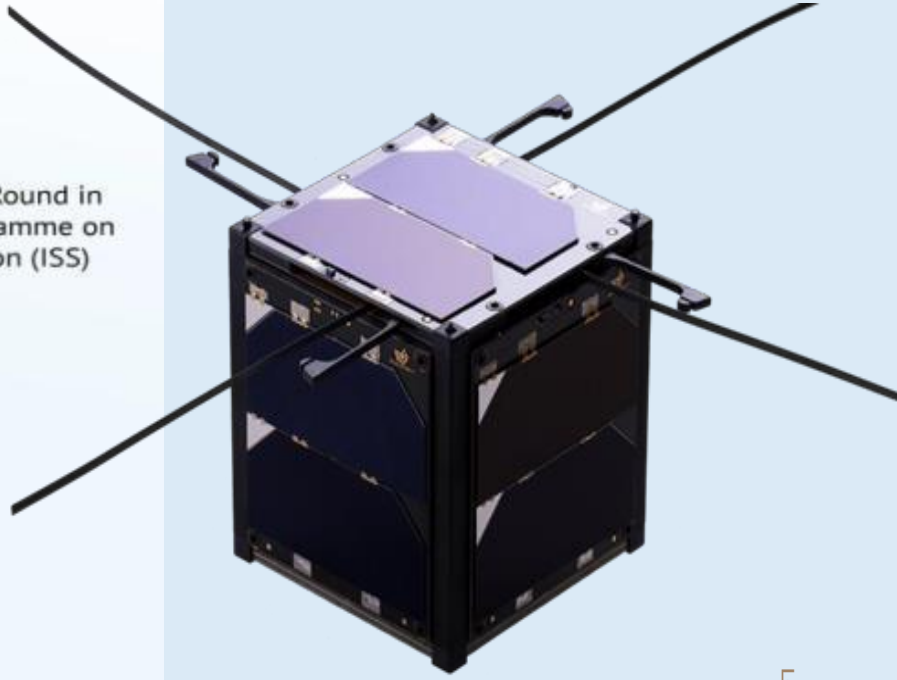
UNOOSA
United Nations Office for Outer Space Affairs

TUMnanoSAT

proposal for CubeSat Mission Application for the Fourth Round in the framework of United Nations/Japan Cooperation Programme on CubeSat Deployment from the International Space Station (ISS) Japanese Experiment Module "KiboCUBE"

Chisinau, 2019

TUMnanoSAT proposal for Deployment from the International Space Station (ISS) "KiboCUBE"



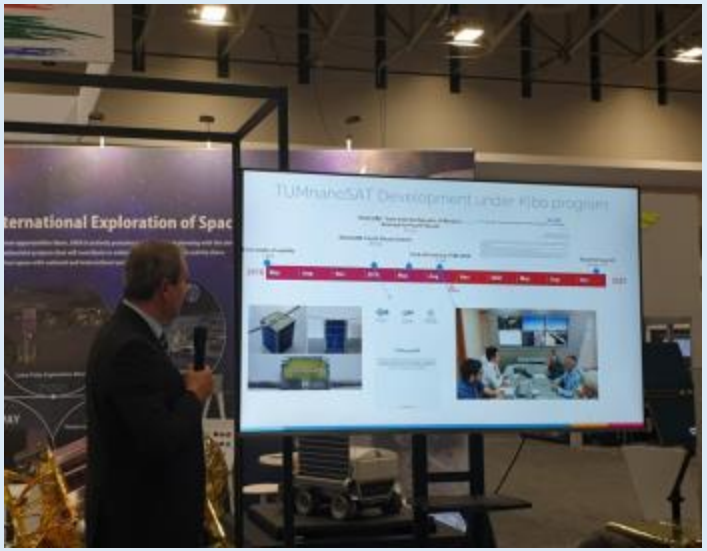
TUMnanoSAT in the KiboCube program

JAXA/TUM/UNOOSA kickoff meeting, organized by the Technical University of Moldova in collaboration with the United Nations Office for Outer Space (UNOOSA) and the Japanese Aerospace Exploration Agency (JAXA)

TUMnanoSAT in the KiboCube program

IAC-2019 & KiboCube

The Rector of UTM, Viorel BOSTAN, and Valentin ILCO, CNTS researcher, represent TUM at the world's largest meeting of space professionals - the 70th International Astronautics Congress (IAC-2019).



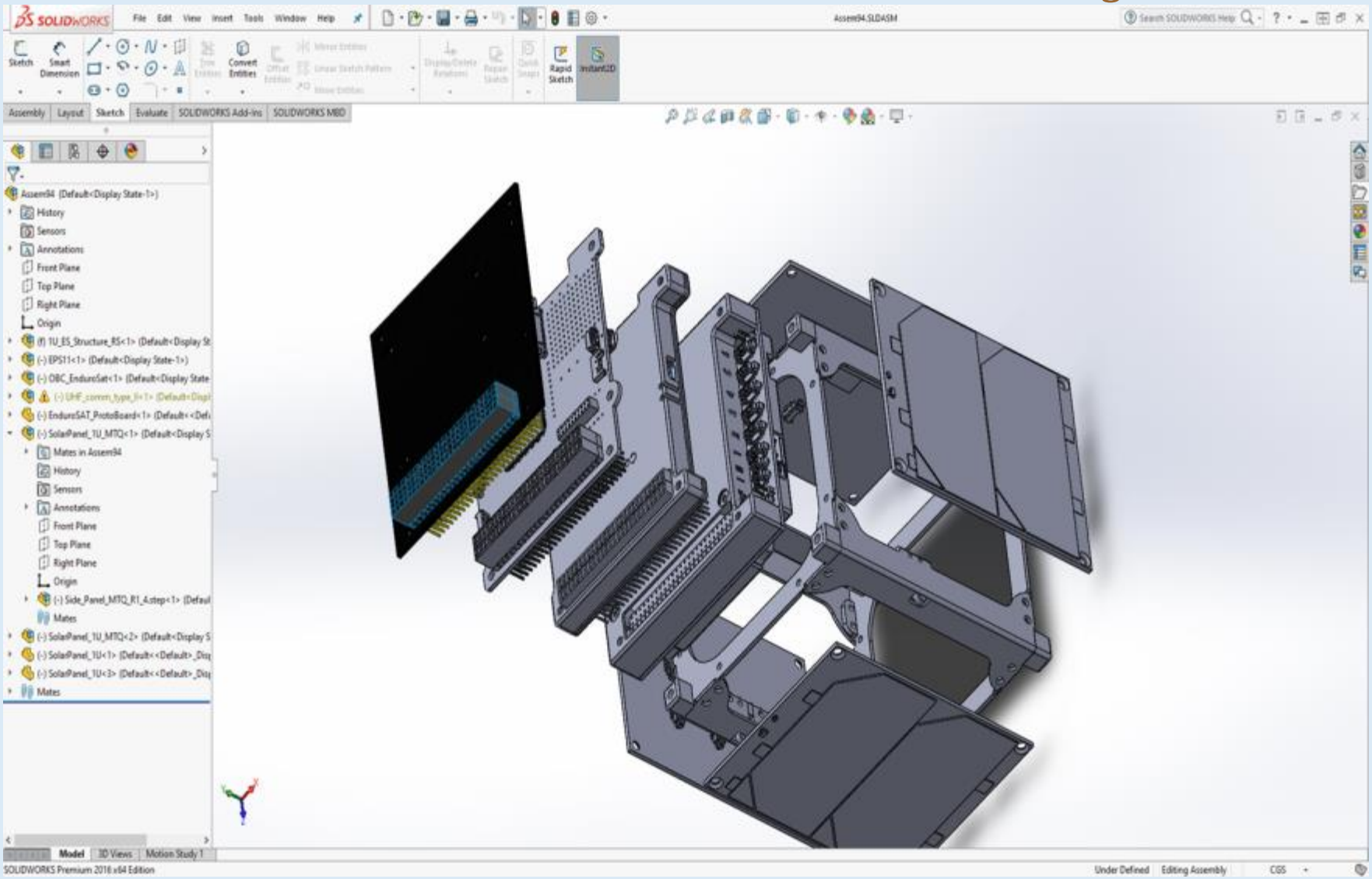
TUMnanoSAT project

"TUMnanoSAT" presented for round IV of KiboCube includes the following basic missions:

- development of an efficient subsystem of communication "satellite-ground station";
- studying the functionality and behavior of nano- and micro-wire sensors in space conditions;
- testing subsystem sensors to determine the satellite's attitude (magnetometers, micro-gyros, solar sensors) for optimizing attitude control algorithms.
- testing of the solar energy supply system in order to obtain the optimal modes of accumulated energy distribution;
- testing the reliability of electronic components under the conditions of space radiation.

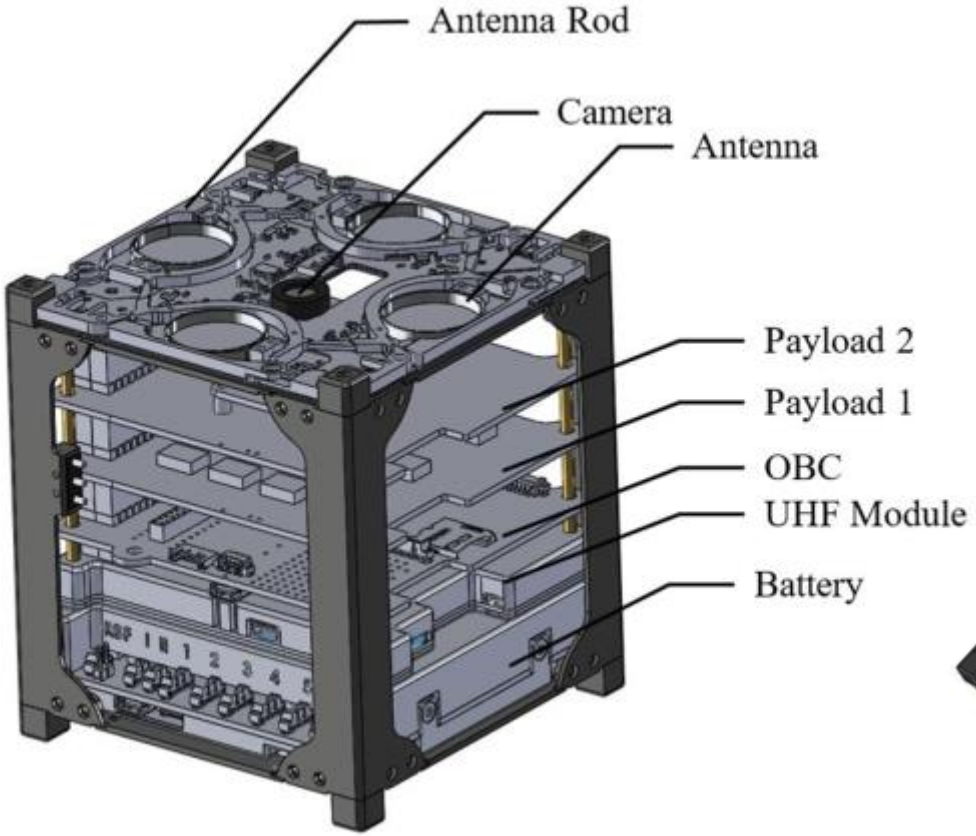
TUMnanoSAT project

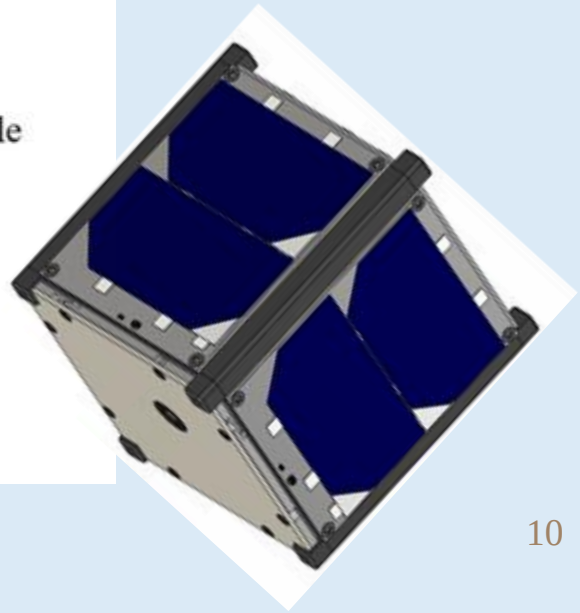
TUMnanoSAT structural and mechanical design



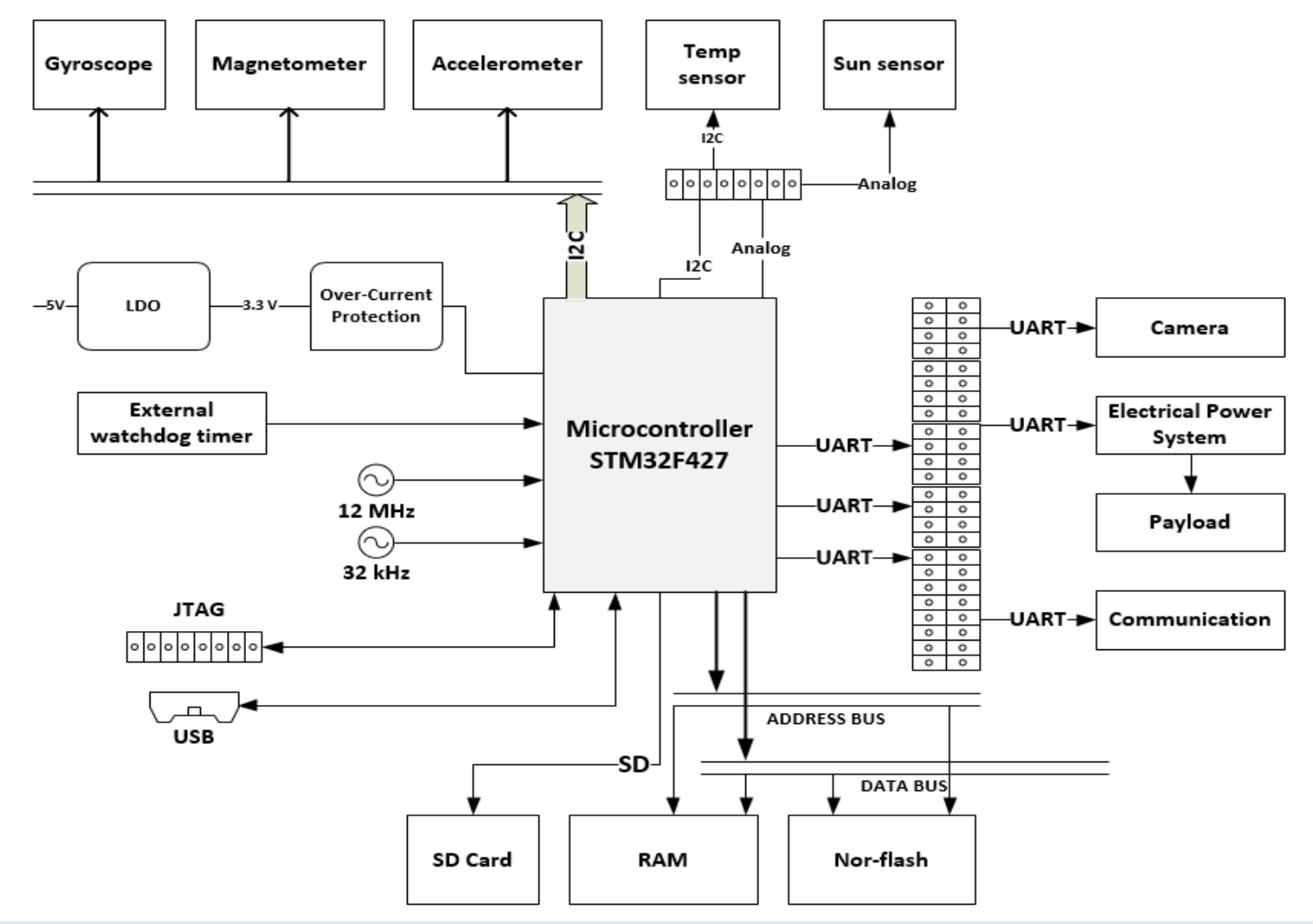
TUMnanoSAT project

TUMnanoSAT components



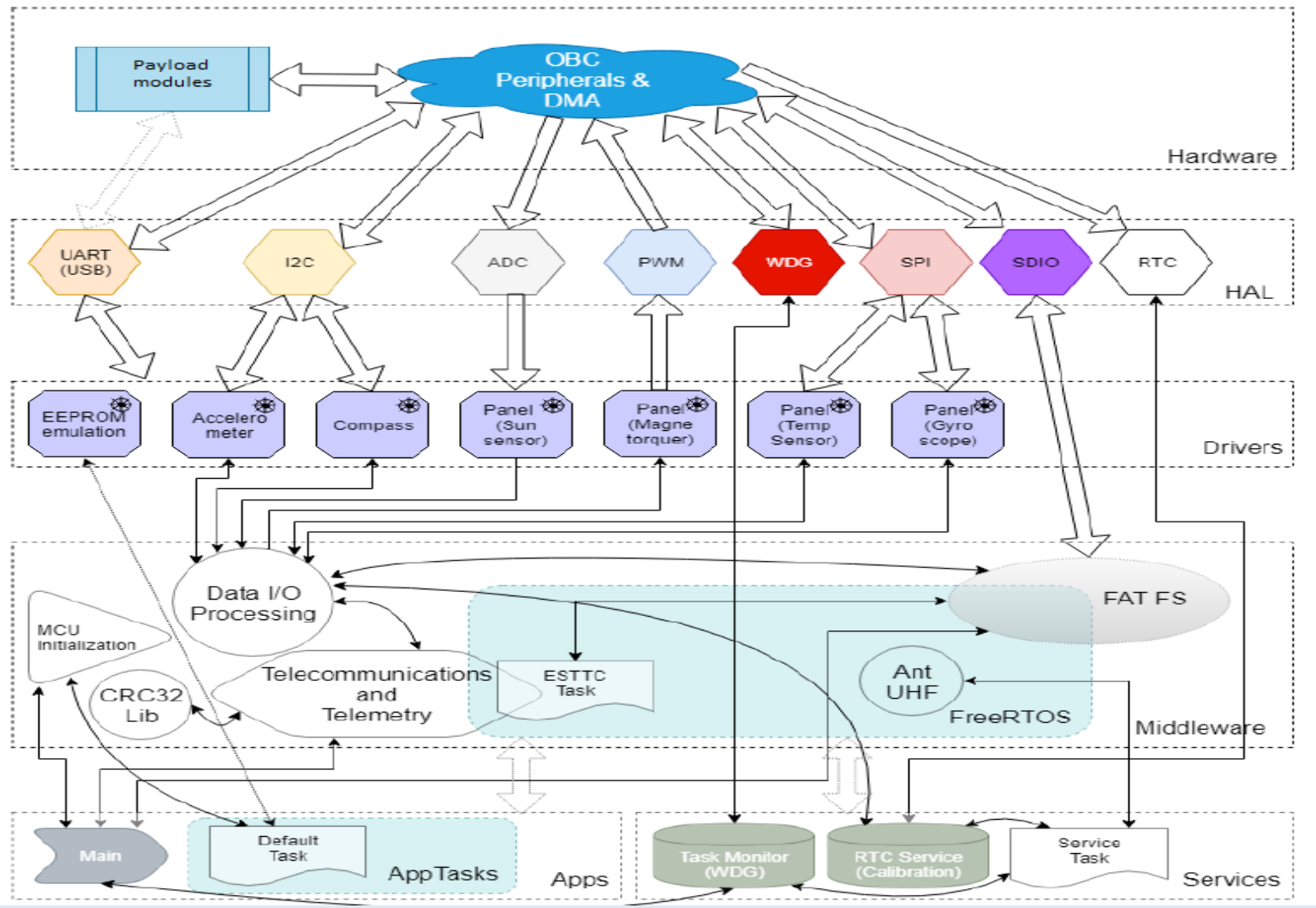


TUMnanoSAT onboard computer

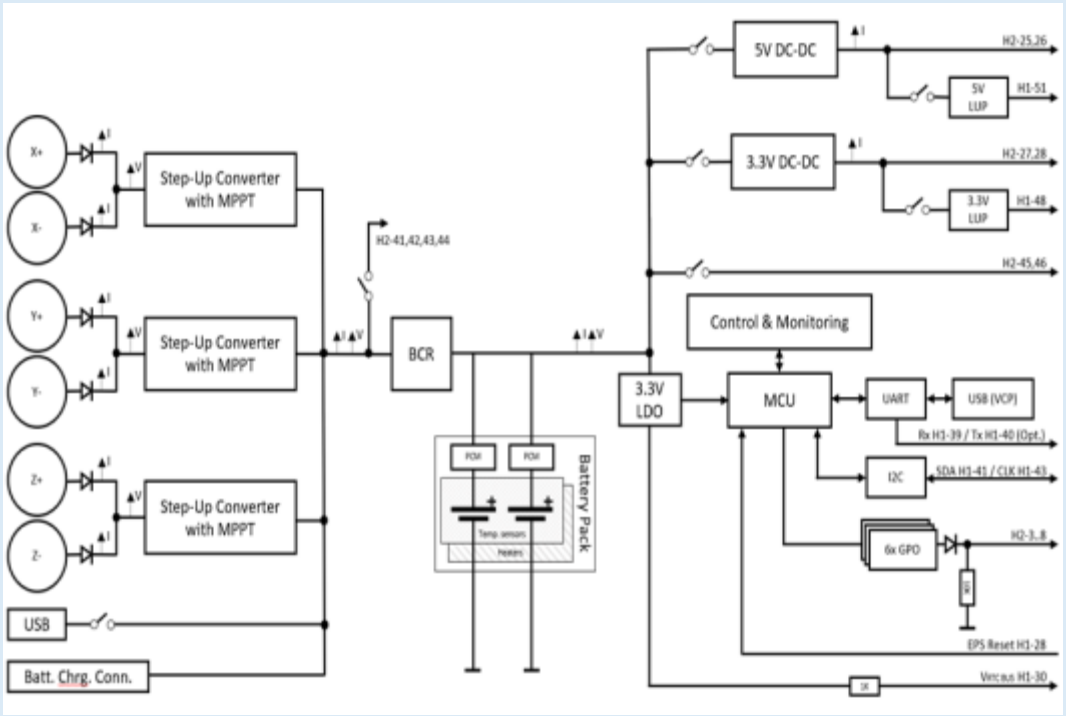


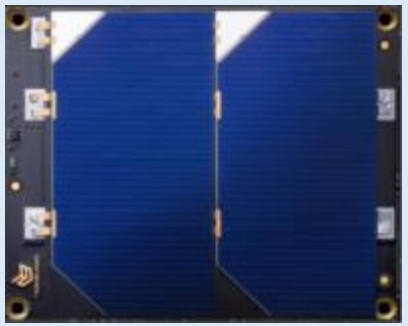
TUMnanoSAT onboard computer

OBC software



TUMnanoSAT Electrical Power System



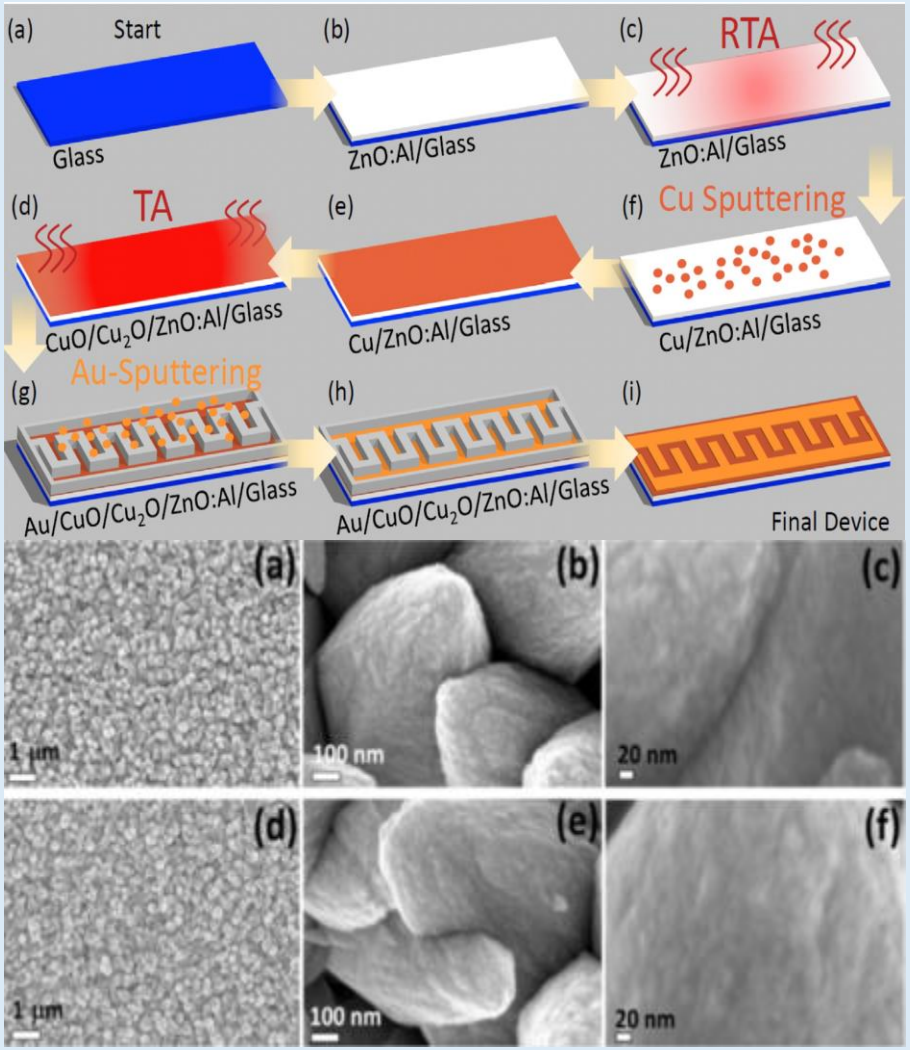


The module contains three channels for solar panels, for each axis of the satellite and a Li-Po battery with a capacity of 10.2 Wh. Each solar panel channel contains a DC-DC step-up converter that uses the MPPT algorithm to ensure maximum efficiency of converting solar energy into electricity and the output current of each power bus (5V, 3.3V, BCR).

TUMnanoSAT - radiation nanosensors

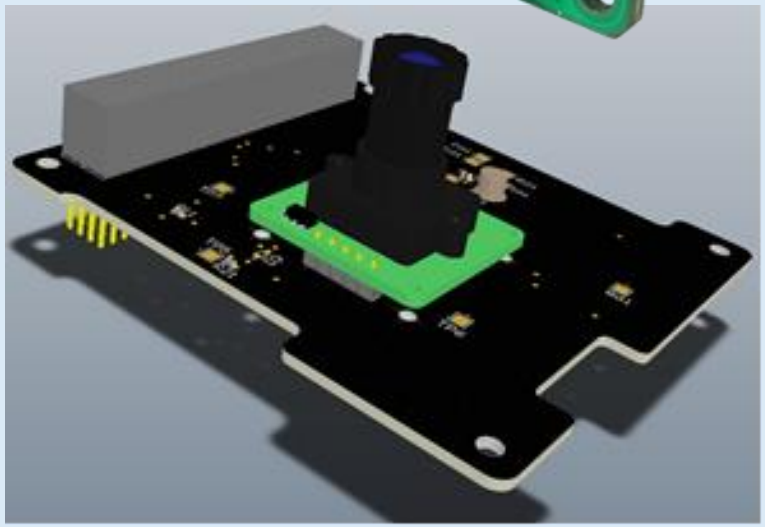
One of mission is testing of nanowire sensors behavior in the space conditions developed by the TUM nanomaterials research center in the fields of material science and nanotechnologies.

The results of testing will be useful focused on the development of new nanomaterials and nano-devices for various applications, including electronics, photonics, bio-medicine etc.



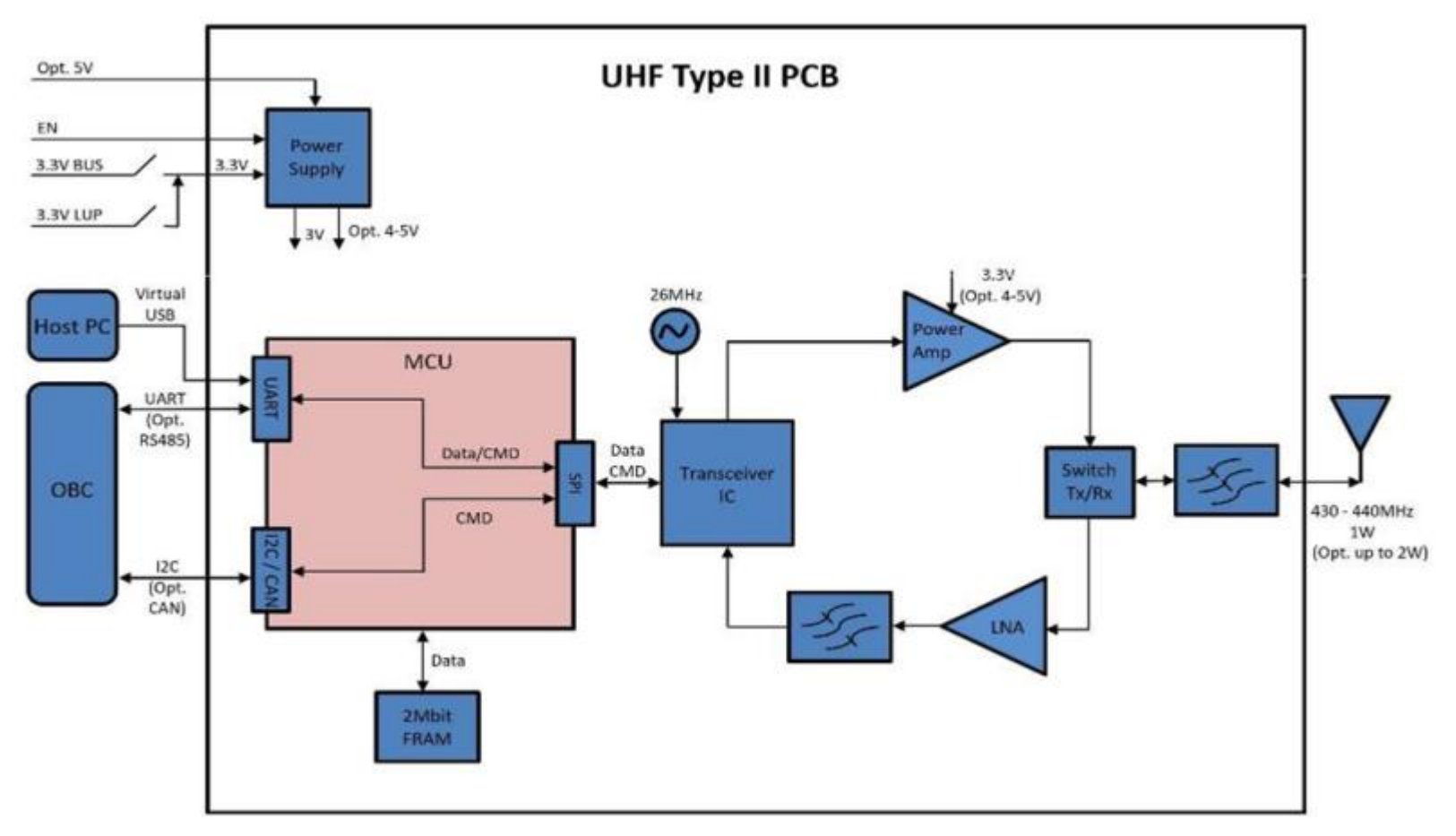
TUMnanoSAT – Digital camera

TUMnanoSAT image capture module include a micro-CAM-II, that is a integrated serial camera module, which uses a CMOS VGA color sensor along with a JPEG compression chip that provides a low cost and low powered camera system. The micro-CAM-II is capable of outputting both format: low resolution (160x120) single frame raw images or high resolution (640x480) JPEG images. It is used the 56 degree lens. The image camera module is intended for capturing low resolution images of the land surface in the local area.
(https://4dsystems.com.au/ucam-iii)



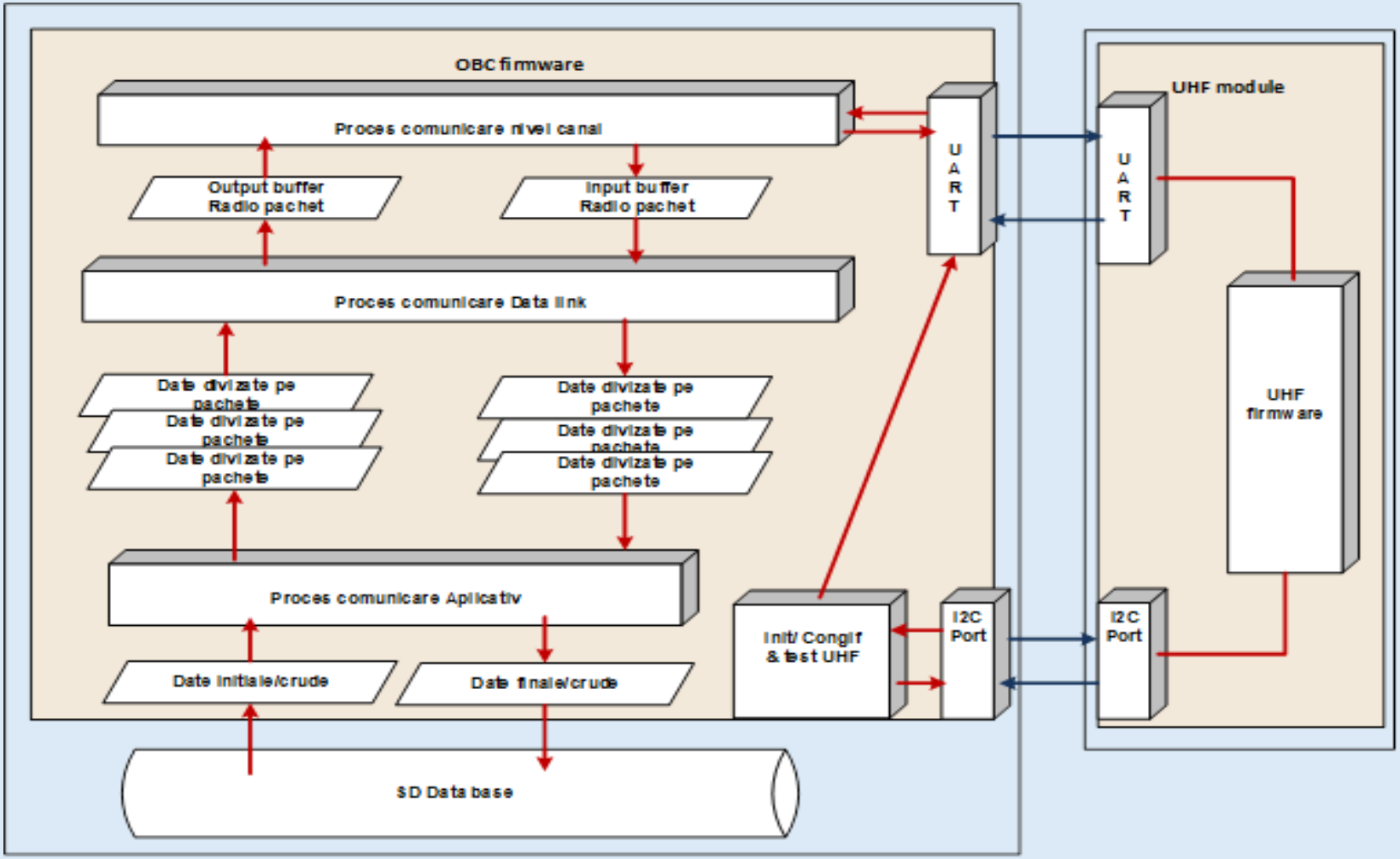
Satellite communication

Communication system UHF Transceiver



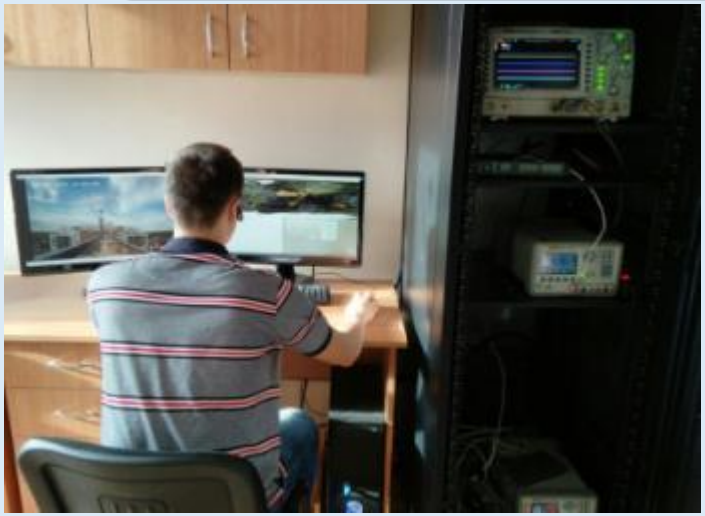
Satellite communication

Software communication tasks



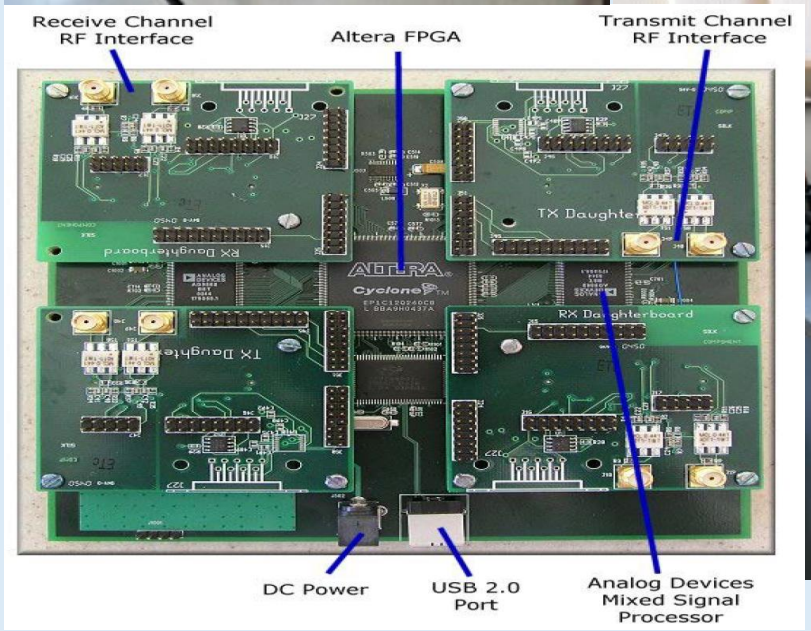
Ground stations infrastructure

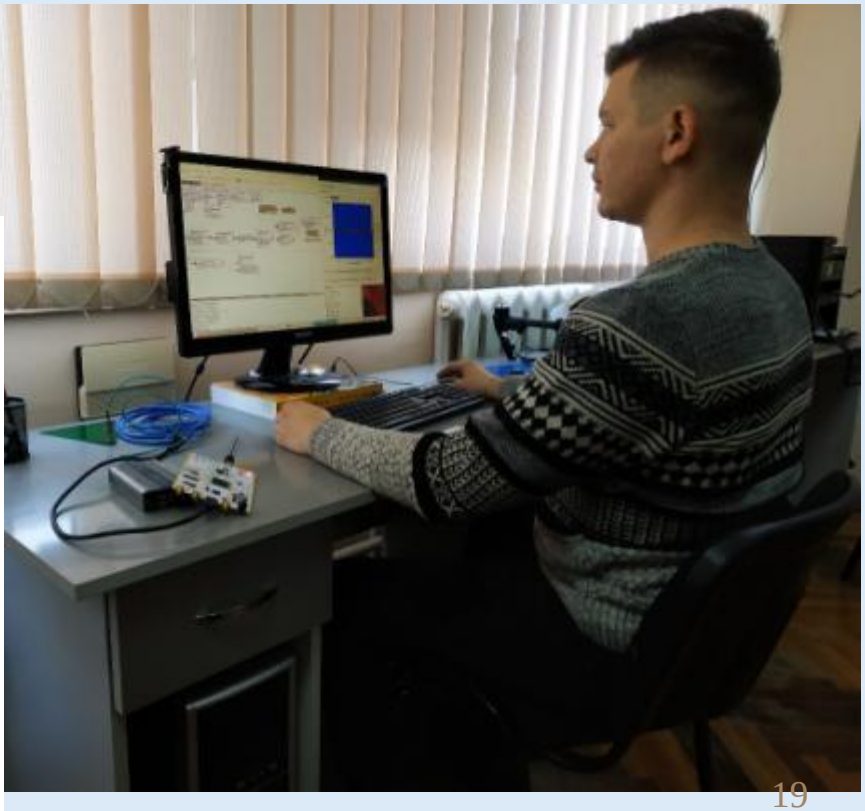
NCST telemetry ground station



Ground stations infrastructure

The design of the communication systems based on the SDR



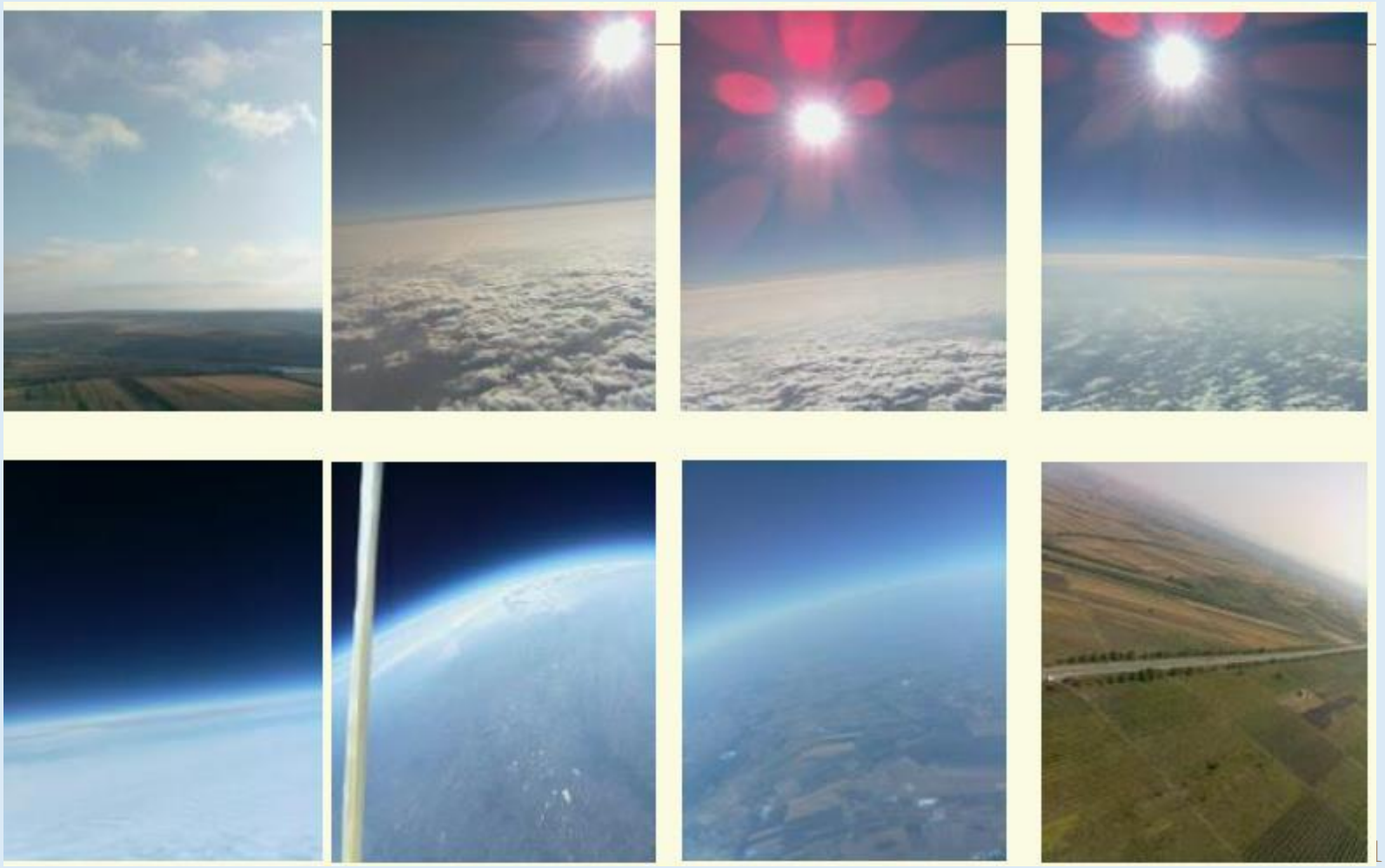


Testing of satellite communication

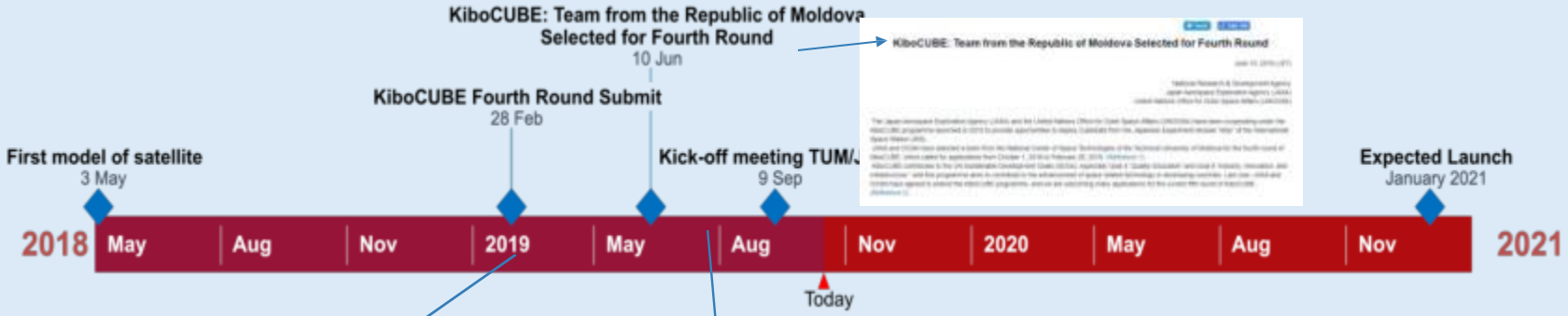
Telemetry data and captured image communication ”microsatellite”- ground station

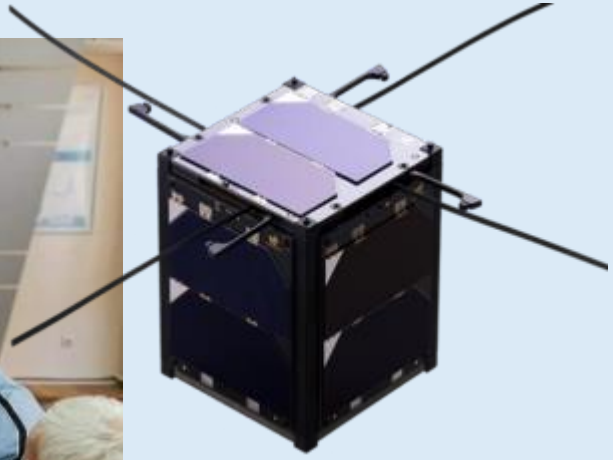
Testing of satellite communication

Captured images by ”microsatellite” from stratosfere

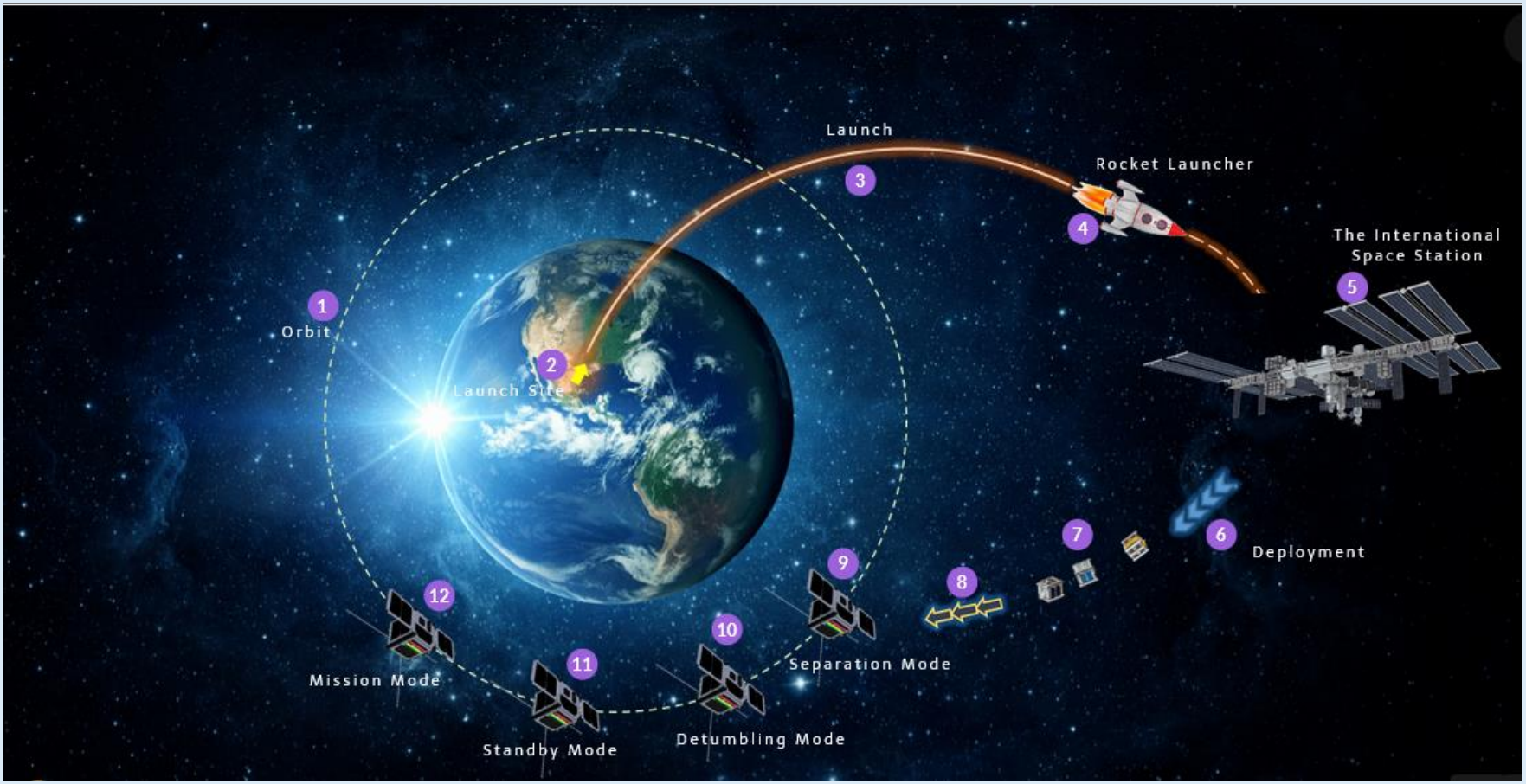


TUMnanoSAT under KIBO Program





Nanosatellite launch, ISS deployment and its orbit



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Thank you
for your attention!