Results of the OPS-SAT Nanosatellite Mission

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OPS-SAT Mission Statement

“OPS-SAT is a safe, hard/software laboratory, flying in a LEO orbit, reconfigurable at every layer from channel coding upwards, available for authorised experimenters to demonstrate innovative mission operation concepts."

OR

Make a Cubesat that behaves like an advanced ESA satellite (as far as the ground can tell) and then let experimenters configure and take control of it.
OPS-SAT
OPS-SAT Overview

3U CubeSat: 10x10x30 cm with deployable solar arrays
Power: 24 W
Launch

Launch by ARIANESPACE on Soyuz-FREGAT from Kourou SSO orbit with 0600 LTAN, 515 km circular
Launch: 18 December 2019
Core of the Satellite
(Satellite Experimental Payload Processor - SEPP)

2 x System on Module
   Altera Cyclone V
   in cold redundancy
2 x ARM-9 processor

Memory
   • 1 GB DDR3 RAM (ECC)

Mass Memory
   • 8 GB

Direct interface to SDR board

By TU Graz
CCSDS compatible Telemetry

OPS-SAT behaves like any ESA spacecraft up to frame level

S-band transceiver with diplexer
50 Mbit/s X-band transmitter
CCSDS Engine with ESA IP Core

By Syrlinks
By SRC/Creotech

Implements MO (mission operations) services at packet level (GMV Poland)
Payloads of Opportunity

- Optical Receiver (MEW Aerospace)
- Software-defined Radio Receiver (MEW Aerospace)
- Fine ADCS (BST)
- Camera (BST)
SDR- Experiment - Signal Monitoring

Measurement of interference signals in UHF and L-band using the Software Defined Radio on board of OPS-SAT

„Spectrum Analyser in Space“
Spectrum Measurement (f = 433 MHz)
Camera Experiment

Camera

Processor

Images of mountainous terrain and a satellite view of a landmass covered in snow.
Optical Communications Experiment

- Transmission of a cryptographic key to OPS-SAT by Laser
- „One-time pad“ method
- Encryption of the 50 Mbit/s X-band Link conducted in September
- Optical receiver commissioned
- OPS-SAT tracked using retro-reflectorexperiment
OPS-SAT uses SMILE

SMILE is the Special Mission Infrastructure Lab Environment:

- a 3.7 m S- and X-band and a amateur radio antenna
- an Operations Lab with e.g. different modems (SDR, Cortex, GOMspace), operator positions, etc..

More information: www.esa.int/smile
Contact: smile.lab@esa.int
Summary

- OPS-SAT: technological mission for demonstrating novel operational concepts, hardware/software experiments
- MO Services, Nanosatellite MO Framework
- On-board software experiments, autonomy
- Camera produces very good results, AI software on SEPP
- SDR produces is very sensitive, 430…1700 MHz
- SpaceWire implementation very good
- Optical experiment prepared
OPS-SAT Consortium

TU Graz (Technical Lead)  
UniTel IT-Innovationen (A), Prime  
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Thank you for your attention!