THE MICROSCOPE SPACECRAFT

- MICRO-Satellite with drag free Control for the Observation of the Principle of Equivalence
- Proposed by ONERA and CERGA Institutes, collaboration with CNES, ESA, DLR, ZARM and PTB
- Based on a MYRIAD platform.
- Mission goal: verify the Einstein equivalence principle, related to gravitational versus inertial mass, with an accuracy never reached before (equivalence at 1e-15).
- Payload: attitude control and fine drag compensation system, differential micro-accelerometers
- Reference orbit: 18h Sun-synchronous circular orbit, altitude : 700 km.

MICROSCOPE in a few words

- two CNES/ Syrlinks EWC15 transceivers (receivers in hot redundancy),
- two MBDA omnidirectional S-Band antennas (in opposite orientation and polarization) for transmission and reception
- RADIALL hybrid 3 dB coupler,
- RF harness composed of 5 pieces of SUCOFLEX 300 cable,
- Telemetry and Telecommand protocols are CCSDS compatible and managed by the onboard data-handling computer (DHU).

MICROSCOPE in a few words

- Full duplex S-band transmission
- Based on COTS
- Can be adapted for dual or single antenna use
- Receiver and transmitter fully independent
- Data rate: 16 to 150 kbps for the receiver and 16 to 625 kbps for the transmitter
- Rx and Tx frequencies can be selected by steps of 100 kHz within the frequency range of 2025 to 2290 MHz

Future generation

- Based on COTS => high performance in processing capabilities, flexibility and power consumption
- Functions management dispatched between a FPGA (high speed processing) and a DSP (heavy computations)
- Electrically and mechanically split into 3 parts (power supply, digital and RF front-end)
- GNSS software functions
  - Satellite acquisition (GPS C/A)
  - Signal tracking for GPS/GALILEO channels
  - Navigation operations (satellite prediction, PVT, ephemeris)
  - Management and control (including health and SEU mitigation mechanisms)
  - Communication with On Board Processor (TM/TC)

GNSS receiver

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  - Satellite acquisition (GPS C/A)
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Some in-flight results

- Powered on at end of April 2016
- Receiver gives an availability of about 99.95%
- GNSS measurements and TM ranging enable orbit restitution accuracy of about 0.089 m radial, 0.297 m along-track and 0.205 m cross-track
- No fault events
- Latest software release to be uploaded during summer 2016