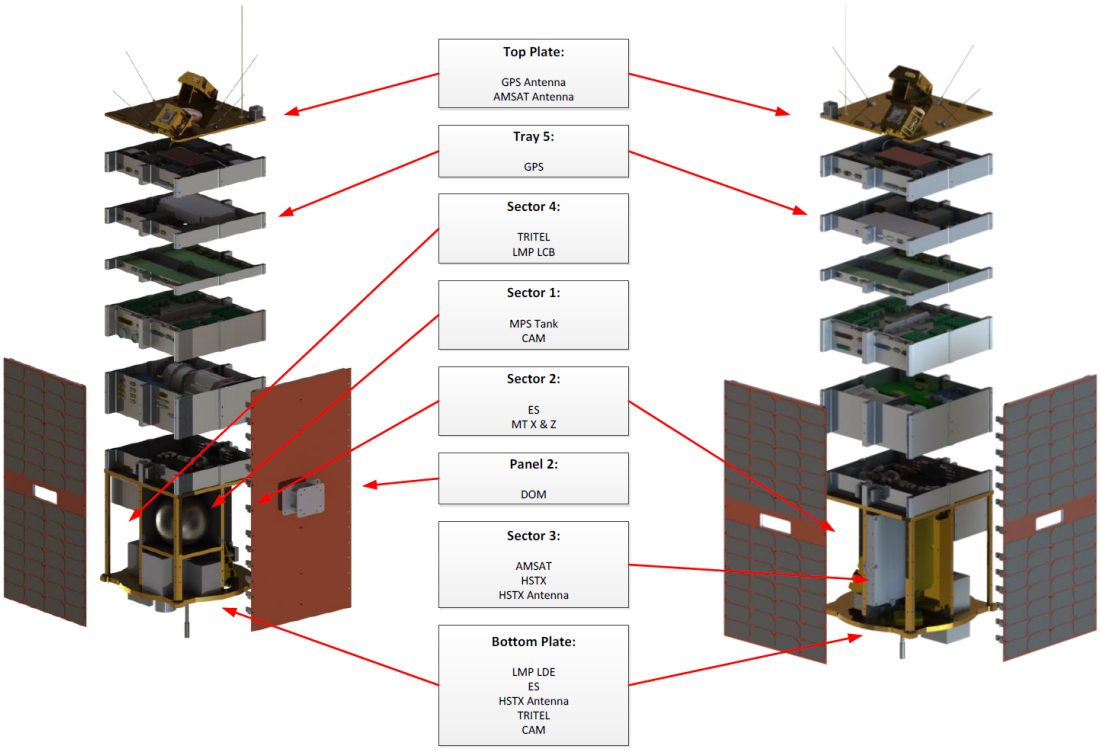
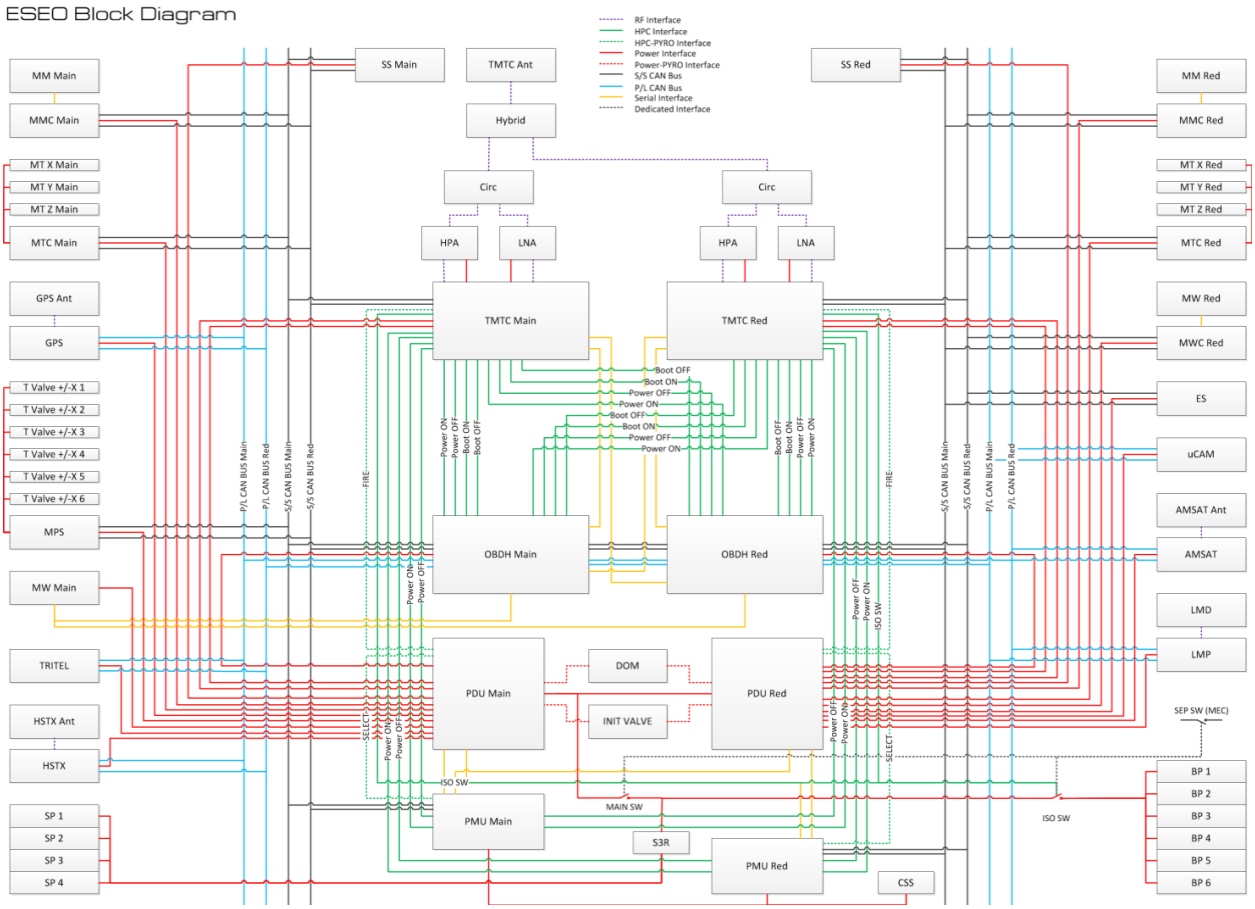
THE ESEO LAYOUT AND SUBSYSTEMS

ESEO layout



- Tray 1: Micro Propulsion System (MPS)
- Tray 2: Momentum Wheel (MW), Magnetorquer (MT) (Y-axis, redundant)
- Tray 3: Power Subsystem (PS) – Power Management Board, Power Distribution Unit, battery Packs, I/F with lateral panels & SAs) [+set of connectors for MAIT operations]
- Tray 4: On-board Data Handling (OBDH) subsystem, MT (X-axis)
- Tray 5: magnetometers (MM), GPS receiver
- Tray 6: Telemetry & Telecommand (TMTC) Subsystem
- Top plate: 2 Sun Sensors (SS), UHF-antenna, GPS antenna, AMSAT antenna, EGSE/umbilical connector (closes bus, provides support to external mounted devices)
- Payload module: Earth Sensor (ES), MPS-titanium tank, Payloads
- Lateral panels: 3 solar panels, De-Orbiting Mechanism (DOM) on panel #2 (Radiator)

ESEO subsystems



Electric Power Subsystem (EPS)

- body mounted solar panels on three sides, 4-string connection each
- comprise Battery Packs (Li-ion), Power Management Board, Power Distribution Unit
- unregulated type, Voltage between 18.2 to 25V

Attitude and Orbit Control Subsystem (AOCS)

- based on three redundant orthogonal magnetorquers, for attitude acquisition maneuvers and coarse attitude pointing as well as a set of two redundant momentum wheels on pitch axis
- a cold-gas micropopulsion system (MPS) has been included in order to provide orbital control and small orbital maneuvers
- ESEO sensors include two redundant unit of sun sensors fully developed by SITAEL S.p.A., two redundant AP539 Three-Axis Magnetometers, and an Earth Sensor
- communication between sensors, actuators and AOCS subsystem is performed by the CAN bus with a CANOpen protocol

Structures and Mechanisms Subsystem (SMS)

- bus module has a tray-based architecture inherited from ALMASat-1, ALMASat-EO, and several microsatellite platforms
- the bus module contains all the main subsystems and the composite payload module (composed of honeycomb and aluminum support) carrying most of the payloads
- four lateral honeycomb panels complete the assembly and provide the substrate for the main solar panels and the radiator.

Telemetry and Telecommand Subsystem (TMTC)

- consists of digital transceiver electronic board (RTX), RF front-end and distribution unit (RFDU) and the antenna network
- the antenna network is a vase turnstile antenna consisting of an array of four dipoles placed in the zenith face of the satellite
- the TMTC subsystem exchanges telemetry data and telecommands with the OBDH subsystem through a dedicated UART interface included in the electronic board design
- TMTC subsystem guarantees a cold redundancy of the transmitter and a hot redundancy of the receiver

On-Board data handling (OBDH)

- equipped with the necessary interfaces for AOCS (sensors and actuators) via two independent CAN buses + an additional CAN bus connection towards the Payloads
- an UART interface connects the OBDH with the main and redundant TMTC Subsystem
- OBDH functionalities:
    - collect platform and payloads housekeeping data
    - generate periodic reports to be transmitted to the ground segment
    - monitor a subset of relevant housekeeping parameters to generate errors + warnings
    - receive, execute or route telecommands from the ground segment
    - generate internal telecommands to manage the subsystems

Thermal Control Subsystem (TCS)

- completely passive, one lateral surface as area for heat radiation