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SPACE SYSTEMS

PRISMA Space Segment

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PRISMA Mission Overview

- PRISMA is a pre-operative mission with the task to deliver hyperspectral and PAN images of the Earth from specific targets requested by the End Users on the defined AoI.
- To this aim the system shall perform the following functions:
 - images acquisition
 - downloading of the collected images to ground
 - processing of the image data
 - delivery of the products to the End User
- Operative modes:
 - **Primary:** on-demand collection of specific Hyp + PAN data
 - **Secondary:** 'background' task to acquire images by fully using satellite and downlink resources

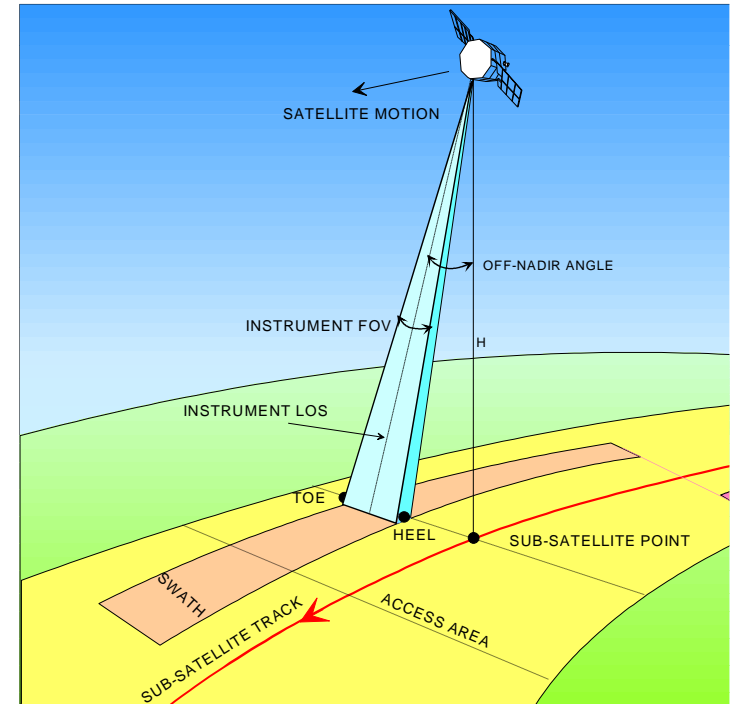


PRISMA Mission Overview

- PRISMA P/L operates with a Pushbroom scanning concept that records reflected radiation from the Earth surface in the
 - PAN range
 - visible/near infrared (VNIR) range
 - short wave infrared (SWIR) range with a band width of 10 nm.

- PAN sensor is characterized by a 5 m GSD (@nadir/sea level); VNIR/ SWIR GSD is 30 m.

- Hyperspectral sensor utilizes prisms to obtain the dispersion of incoming radiation on a 2-D matrix detectors, to acquire several spectral bands (239) of the same strip on ground.

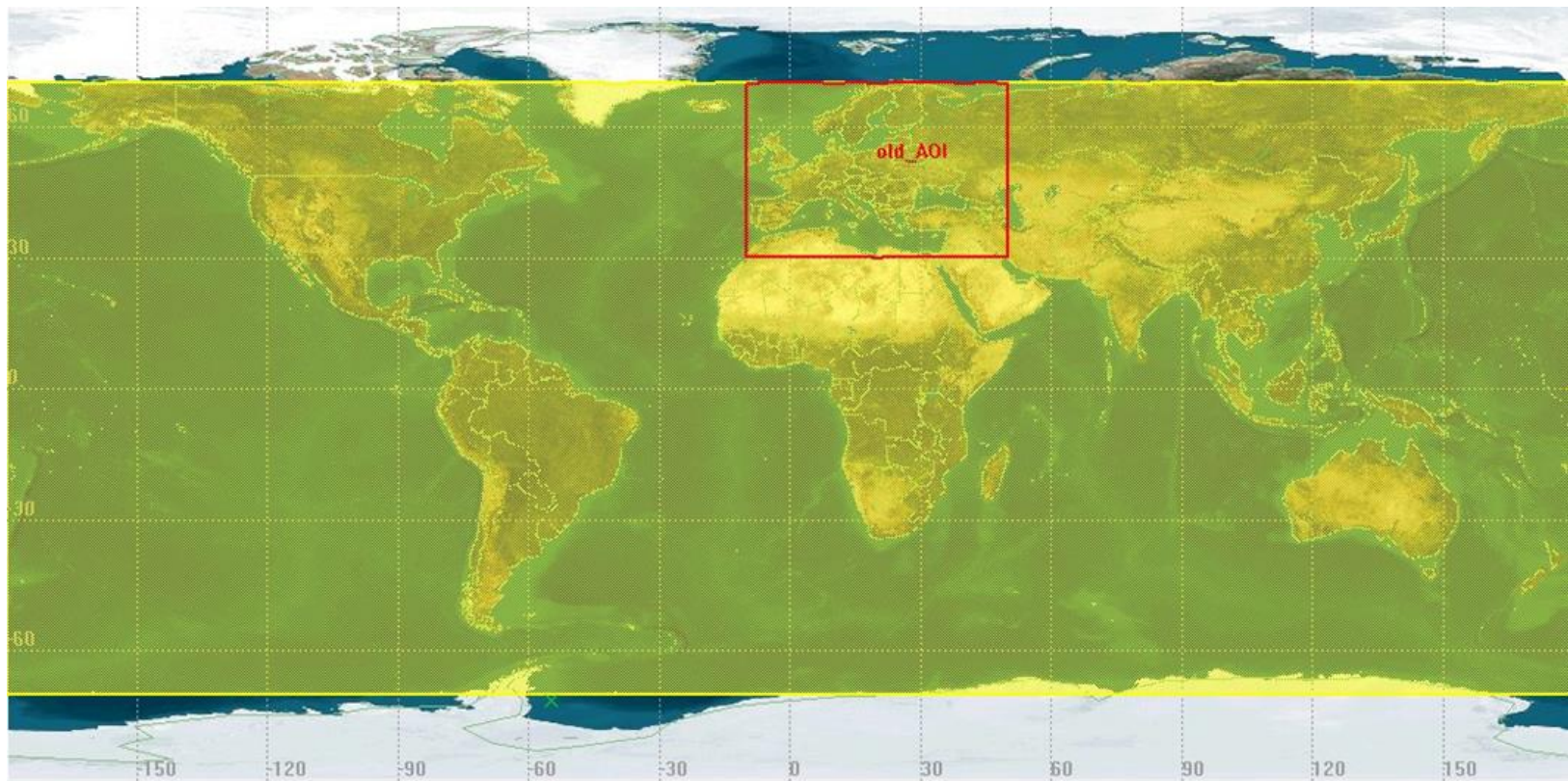


Area of Interest

- Primary Area of Interest

Longitude: $180^{\circ}\text{W} \div 180^{\circ}\text{E}$

Latitude: $70^{\circ}\text{S} \div 70^{\circ}\text{N}$



Imaging capability

- Daily imaging & processing capabilities (Hyp/Pan channels)

Capacity to acquire, download, process up to L0a (including quicklook) and archive all Hyperspectral and Panchromatic channels for a maximum of 200.000 km² on a daily basis

Imaging capacity:

Capacity to daily process 200 hyperspectral scenes (30 km x 30 km) up to level 2d

- Target access opportunities over the P-Aol:
 - duration/day: 240 minutes
 - number of orbits/day: 15/15

PRISMA Mission Overview

- Mission key parameters related to the image acquisition:
 - **revisit time** → capability to observe the same target twice.
 - **area coverage** → ability to observe all the possible targets within the area target
 - **image capacity** → capability to acquire and download all the required data
 - **orbit parameters** → S/N ratio, eclipse period, ground station contacts duration...

- P/L data will be downloaded to CNM (Matera) by X-band link

Orbit	SSO 615 km 10:30 LTDN
Revisit time	7 days
Aol	70° Nord ÷ 70° Sud
Max Off-nadir	±21° across track
Onboard Data Storage	448 Gbit
Downlink data rate	310 Mbps
Imaging capacity	200.000 km ² /day Pushbroom, strip ≤ 1800km
Dv	120 m/s
Pointing accuracy	< 1 km
Response time	< 14 days (acquisition latency < 9.5 days processing latency < 4.5 days)
Launch	Mid 2018, VEGA LV
Lifetime	5 ys

PRISMA System Architecture

- PRISMA System is made by:
 - **Space Segment:** one small Satellite
 - **Ground Segment**
 - ❖ Fucino: MCC (Mission Control Center) / SCC (Satellite Control Center)
 - ❖ Matera: IDHS (Image Data Handling System)
 - **Launch Segment:** VEGA



PRISMA System Architecture

Access to the Users:

The system provides a single interface to the Users for catalogue browsing, acquisition requests and product ordering:

- the IDHS provides catalogue searching functions, manages the request for archived products, delivers data (through ftp or physical media)
- the MCC handles the requests of acquisition of images

Data acquisition procedure:

- nominal satellite attitude is sun-pointing (power)
- earth-pointing and payload activation over the required area target
- data recorded into the PDHT memory and downloaded to the X-Band ground station (CNM, asap)

Telemetry and telecommands:

- bi-directional S-band link to a Ground Station located in Fucino

Orbit maintenance:

- calculated and planned by the flight dynamics function of the SCC
- time tagged telecommands generated by the MCC
- TC uploaded to the satellite by the SCC itself

Launch segment:

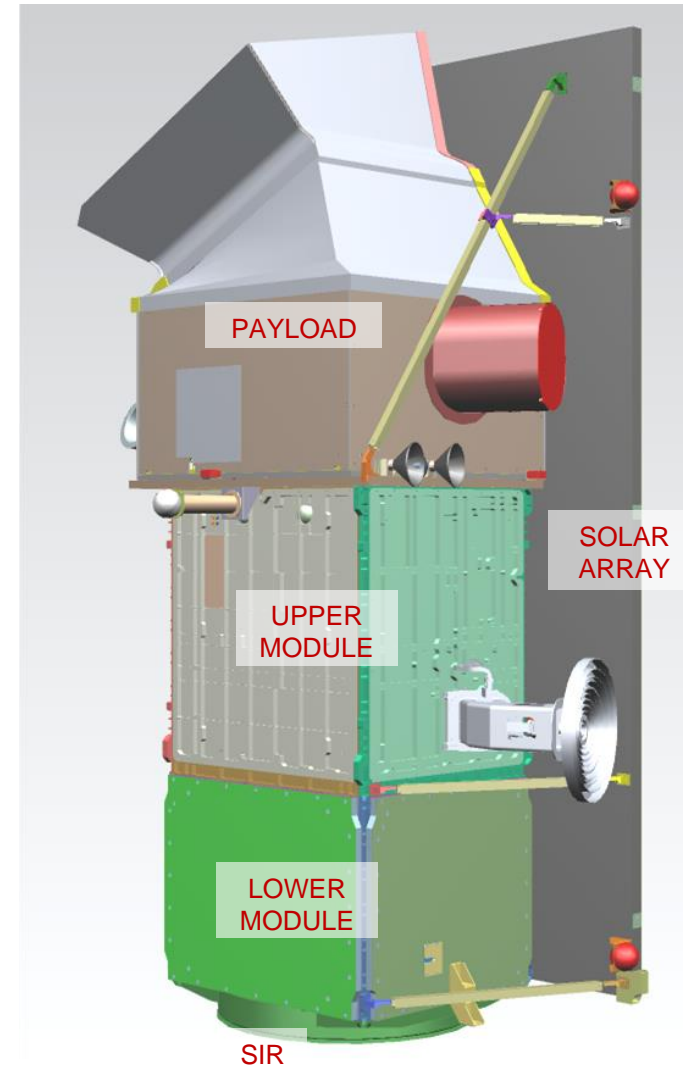
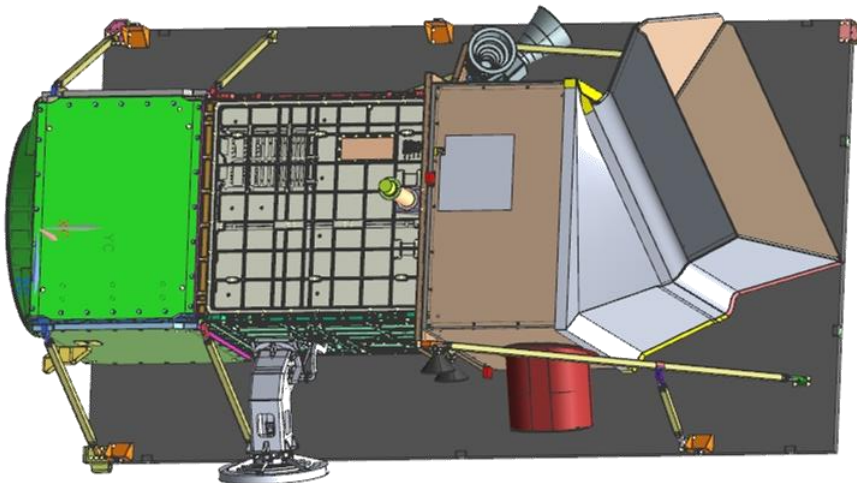
- “small class” dedicated launcher (single launch) to inject the satellite in its final orbit (VEGA).

The Spacecraft

The Space Segment consists of a single satellite placed in a LEO SSO orbit with an operational lifetime of at least 5 years with nominal performance.

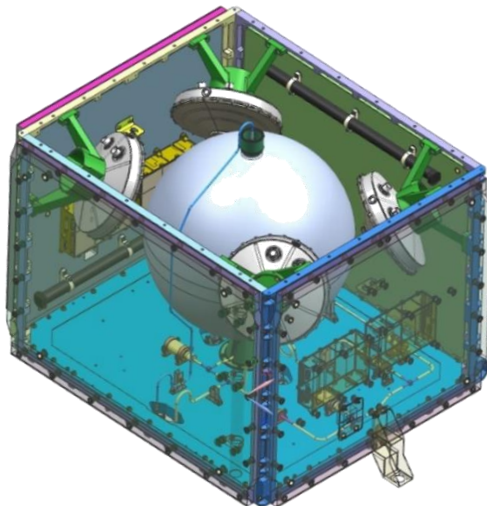
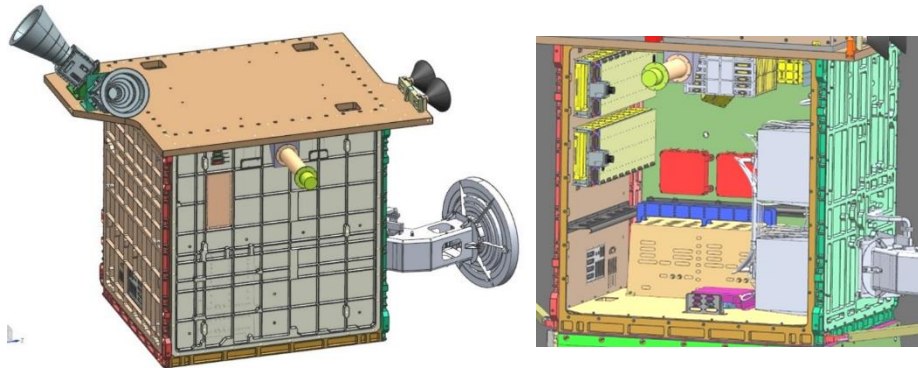
The S/C is composed by:

- a **Platform**
- a **Payload**, consisting in a Hyperspectral / Panchromatic instrument (derived from HypSEO mission)
- a **Payload Data Handling and Transmission unit (PDHT)**



Platform Subsystems

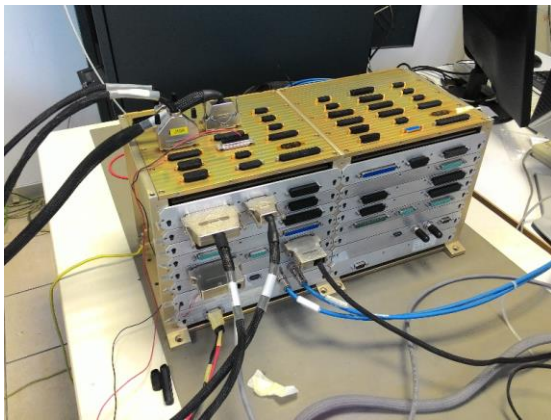
Platform will provide all the resources required by the Payload in order to satisfy the mission objectives.



Dimensions	2.17 m x 1.47 m x 3.59 m
Mass	~ 800 Kg
Solar array	~ 1320 W EoL
Power (average)	~ 450 W
Pointing accuracy	~ 100 arcsec @ 3s
Pointing knowledge	~ 70 arcsec @ 3s
Off-nadir	+/- 21°
TT&C	S-band
Propulsion	Hydrazine, DV ~ 120 m/s
AOCS actuators	<ul style="list-style-type: none"> • Reaction wheels • Magneto-torquers
AOCS sensors	<ul style="list-style-type: none"> • Sun sensors • Star sensors • Magnetometers • Gyro's • GPS
LV	VEGA

S/C Model Philosophy

- PRISMA S/C has already accomplished a **successful** structural qualification campaign using a new SM model
- **Compliance** to VEGA environmental loads demonstrated:
 - Sine
 - Acoustics
 - Shock (VESTA and drop test)
- Main S/C Units EM used for functional and interface verification (OBDH and P/L ME already tested with PDHT)
- S/C PFM will jump into the Acceptance Test Campaign at the end of 2017



OBDH EM



S/C SM