

THE PRISMA AND PRISMA-PSG MISSIONS status and updates

Luigi ANSALONE – ASI

Prepared by: L. Ansalone,

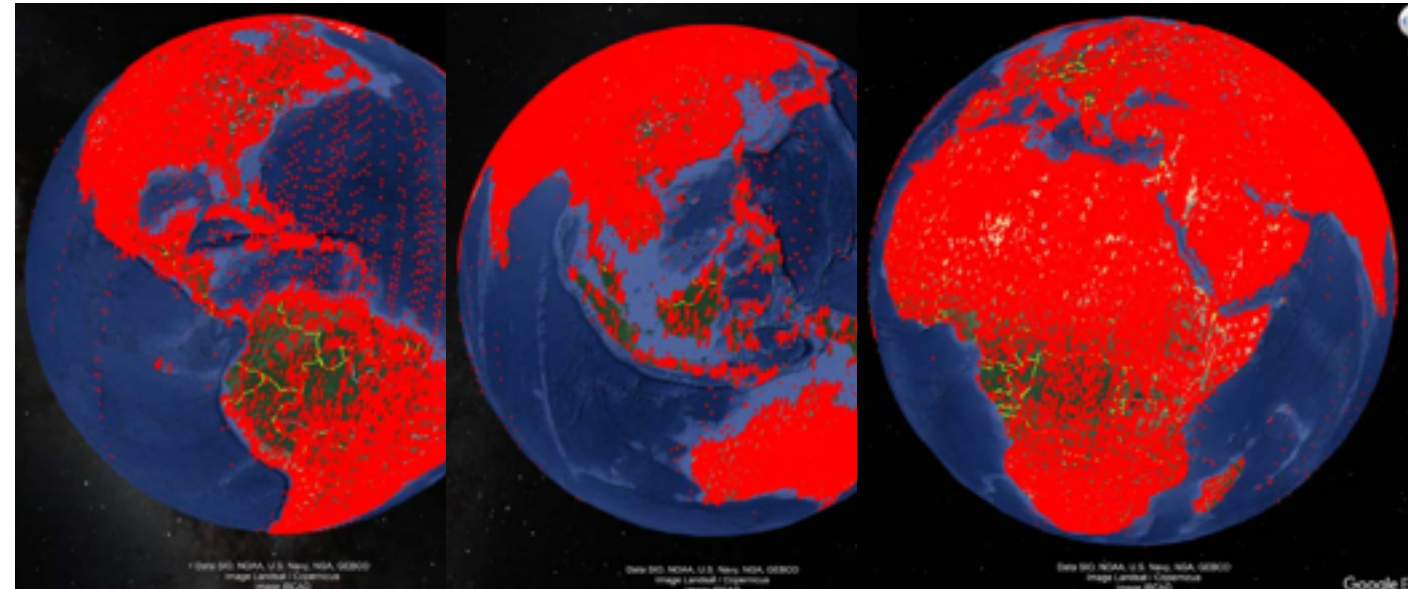


Agenzia Spaziale Italiana



PRISMA: PRecursores IperSpettrale della Missione Applicativa

- ❖ National EO hyperspectral Mission fully funded by ASI and realized by Italian Industries Consortium led by OHB Italia, Leonardo and Telespazio
- ❖ PRISMA Records (pushbroom scanning mode) the radiation reflected from the Earth surface (spectral cubes) in 400nm – 2505nm spectral window
 - 240 total bands in VNIR (#66 , 400–1010 nm) & SWIR (#174, 920–2505 nm), partial spectral overlap
 - High spectral Resolution (better of 14 nm)
 - Medium spatial resolution (30m) and swath (30km)
 - PAN camera (400–700 nm) offers added capability with 5m spatial resolution
- ❖ Access to Users opened on May 2020 <https://prisma.asi.it/>
- ❖ Mission runs nominally, still 1.5y lifetime (planned)
- ❖ **1504** Licenses to Use (user groups) activated @ 04.10.2022
- ❖ **186k** images (including those from the background mission) all over the world @06.10.2022



❖ Main Updates:

- New data Policy for commercial users
- High Geolocation accuracy (15m CE90) on products
- Pre-feasibility tool
- PRISMA Toolbox

PRISMA Second Generation - the initial survey



- During the **Hyperspectral Remote Sensing Workshop 2021: PRISMA Mission and beyond** held in **Rome on April 13th and 14th 2021**, ASI has announced the opening of the users survey for the PRISMA Follow On Mission, called PRISMA Second Generation
- The Survey “**Hyperspectral Remote Sensing Consultation Process: beyond PRISMA Mission**» has been opened on May 10th and closed on June 16th 2021

To include the community 2 milestone have been foreseen

- Preliminary User Requirement Review (PURR)
- Final User Requirement Review (FURR)
- Clear desiderata by users:
 - Systematic acquisitions / Capability of processing on-demand specific request
 - Stripmap (30 m GSD) and Spotlight (10 m GSD) modes
 - Coverage requirements on Italy, Europe, World
 - High SNR, high quality images, **high number of images**

PRISMA Second Generation - Objectives



- Industrial Contract started on February 2022
- Phase A is going to be closed successfully
- Phase BCDE1 to be started soon

SIX HIGH LEVEL OBJECTIVES

- Competitive Infrastructure
- Hyperspectral data continuity
- System Key features (two satellites)
- Deployment times very challenging
- Efficient Resources Planning for on-demand requests
- Agility to increase SWATH and SNR



PRISMA Second Generation



- Challenging Radiometric, spectral and geometric performance
- Stereo, tristereo and same-latitude acquisitions
- 7 years mission, operative mission
- Launch foreseen between 2025 and 2026



- Two acquisition modes, stripmap and spotlight. Low revisit time

- global coverage - 2.2 millions of km² imaged per day

- Dynamic Planning

More than one satellite, need of a constellation

PRISMA Second Generation - modes



PRISMA Second Generation is the future Hyperspectral Italian Constellation, to be launched in 2025.

- » Entirely Funded by the Italian Space Agency
- » Hyperspectral data continuity currently available by the PRISMA system.
- » A big high-performance satellite + a small sat confirming PRISMA performances



SPECS High performance sat:

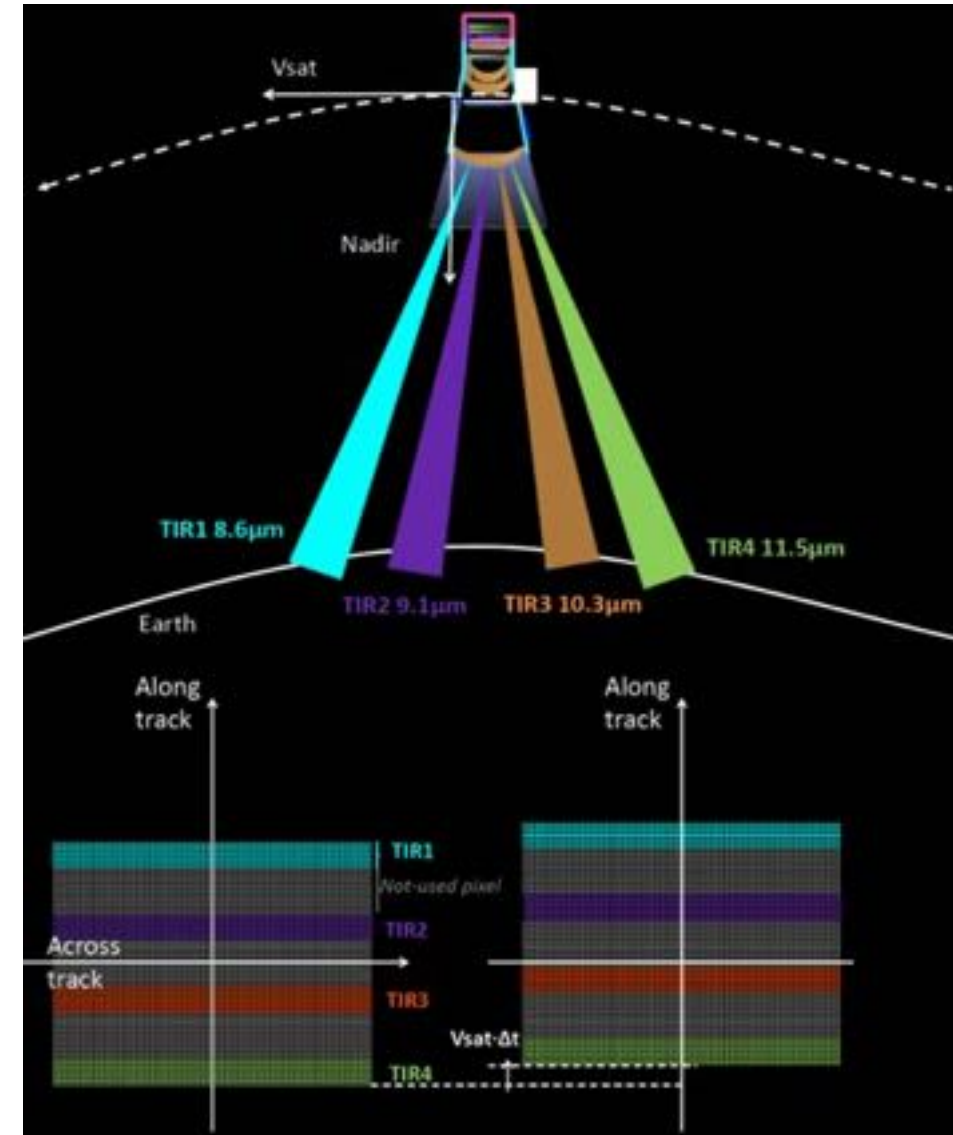
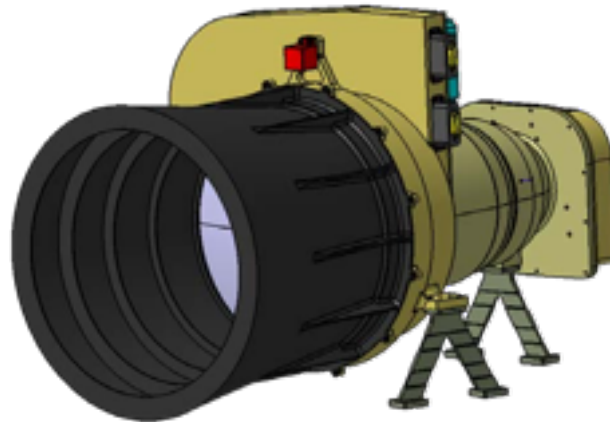
- » SWATH and SNR: on demand techniques of SWATH enlargement and SNR enhancement on a single pass using the platform agility.
- » Low revisit time (72 h with a maximum off-nadir angle of $\pm 30^\circ$)
- » Acquisition modes: STRIPMAP and SPOTLIGHT.
 - **STRIPMAP image:** VNIR/SWIR GSD ≤ 30 m and PAN GSD ≤ 5 m, swath ≥ 30 km and indefinite length with a Daily STRIPMAP Imaging Capacity (acquire, downlink and archive) more than 2.000.000 km².
 - **SPOTLIGHT image** (on-demand): VNIR/SWIR GSD ≤ 10 m and PAN GSD $\leq 2,5$ m, swath ≥ 30 km and length up to 210 km with a Daily SPOTLIGHT Imaging Capacity (acquire, downlink and archive) more than 200.000 km².

PRISMA Second Generation – the TIR payload



- » The FPA array is divided in four 1024x32 pixel are each of them associated with a spectral band.
- » Four spectral bands are projected on ground in different ALT position.
- » Thanks to satellite motion the 170Km is composed by several detector acquisition $\sim 120s$.
- » Thanks to **GMC** (4.35), the detector frame rate can be low enough $\sim 21Hz$ and TDI technique can be implemented to increase NE ΔT

band	TIR
GSD [m]	40
Swath [km]	40
Strip [km]	> 100
Accuracy	< 1,5 K
Spectral Range	8 – 12 micron
# spectral bands	4 bands: 8.6 - 9.1 - 10.3 - 11.5 (μm)
Temperature Accuracy	< 1,5 K
NEDT	< 1 K
Minimum Detectable Temperature	250 K
Saturation Temperature	600 K



PRISMA Second Generation – PLT4

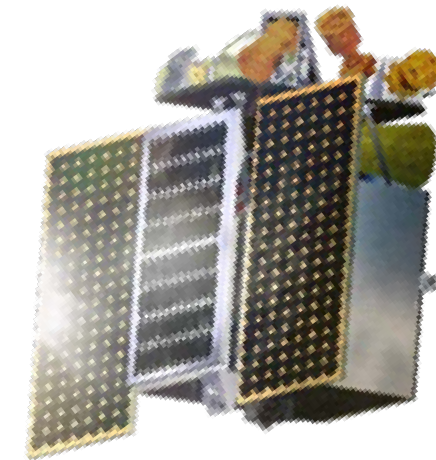


»PLT4 will be the satellite companion of PRISMA2GEN

Earth observation payload with compact innovative electro-optical instrumentation which combines a hyperspectral sensor with a panchromatic camera. This combination couples geometrical characteristics recognition at high resolution chemical-physical composition scene.

This offers the scientific community and users many applications in the field of environmental monitoring, resource management, crop classification, pollution control, etc. Further applications are possible even in the field of National Security.

	Readiness: 2025
band	VNIR - SWIR
GSD [m]	30 x 30
GSD GMC [m]	15 x 15
GSD PAN [m]	5 x 5
Swath [km]	30 x 210
Spectral Range (nm)	VNIR: 400 – 1010 SWIR: 920 – 2500
# spectral bands	>230(VNIR-SWIR)
Spectral Resolution (nm)	< 10
VNIR SNR	>200:1
SWIR SNR	>100:1
VNIR GMC SNR	>100:1
SWIR GMC SNR	>50:1
MTF	VNIR/SWIR AT > 0.25 VNIR/SWIR CT > 0.25 PAN AT > 0.10 PAN CT > 0.10



PRISMA Second Generation, the constellation



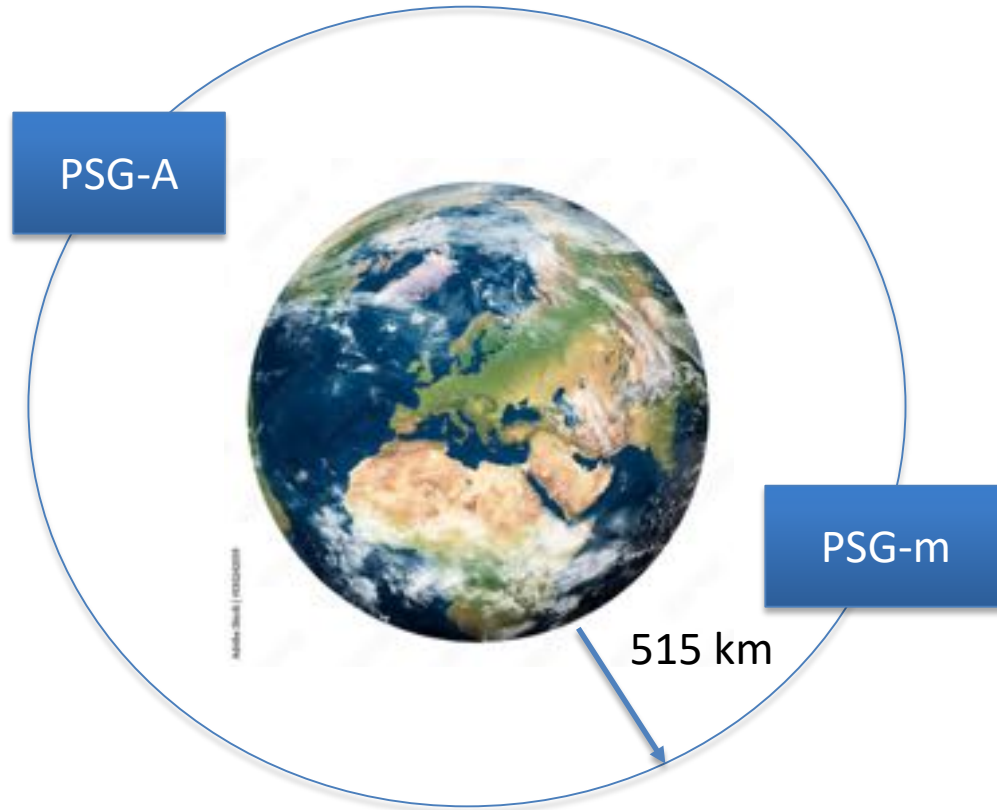
Constellation based on heterogeneous satellites

- PSG-A large satellite around 1000 kg
- PSG-m mini satellite around 300 kg

Possible dual launch in evaluation

First Phase of the mission in formation flying, possibility to observe the same scene in less than one minute

PRISMA Second Generation, the constellation



After cross calibration check, one satellite is moved to form a 180 degrees constellation

Thank you for your attention



Agenzia Spaziale Italiana

luigi.ansalone@asi.it

Agenzia Spaziale Italiana

Via del Politecnico snc

00133 Roma, Italia

www.asi.it

