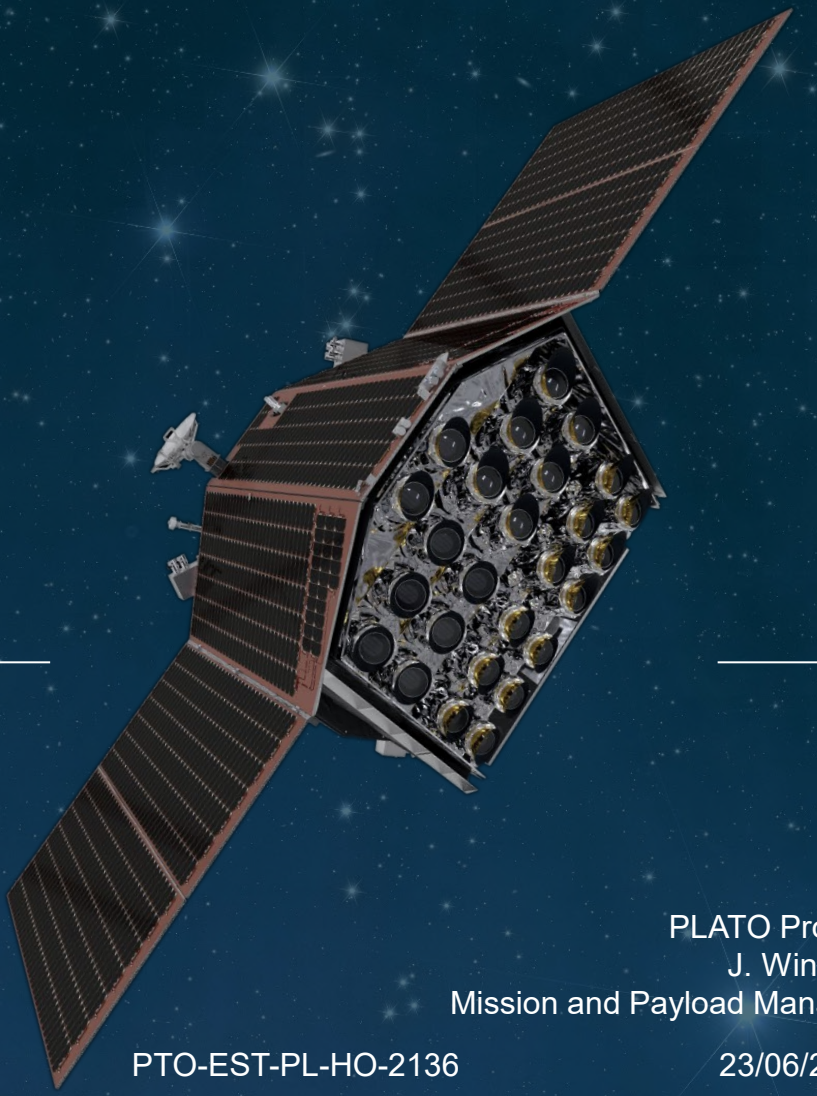
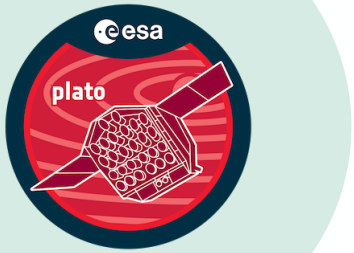
PLATO Instrument Status
ESP2025



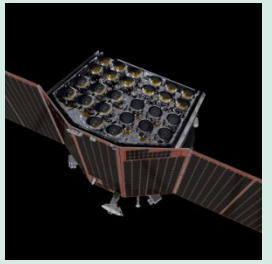
PLATO Project
J. Windsor
Mission and Payload Manager

PTO-EST-PL-HO-2136 23/06/2025

Agenda



MISSION OVERVIEW



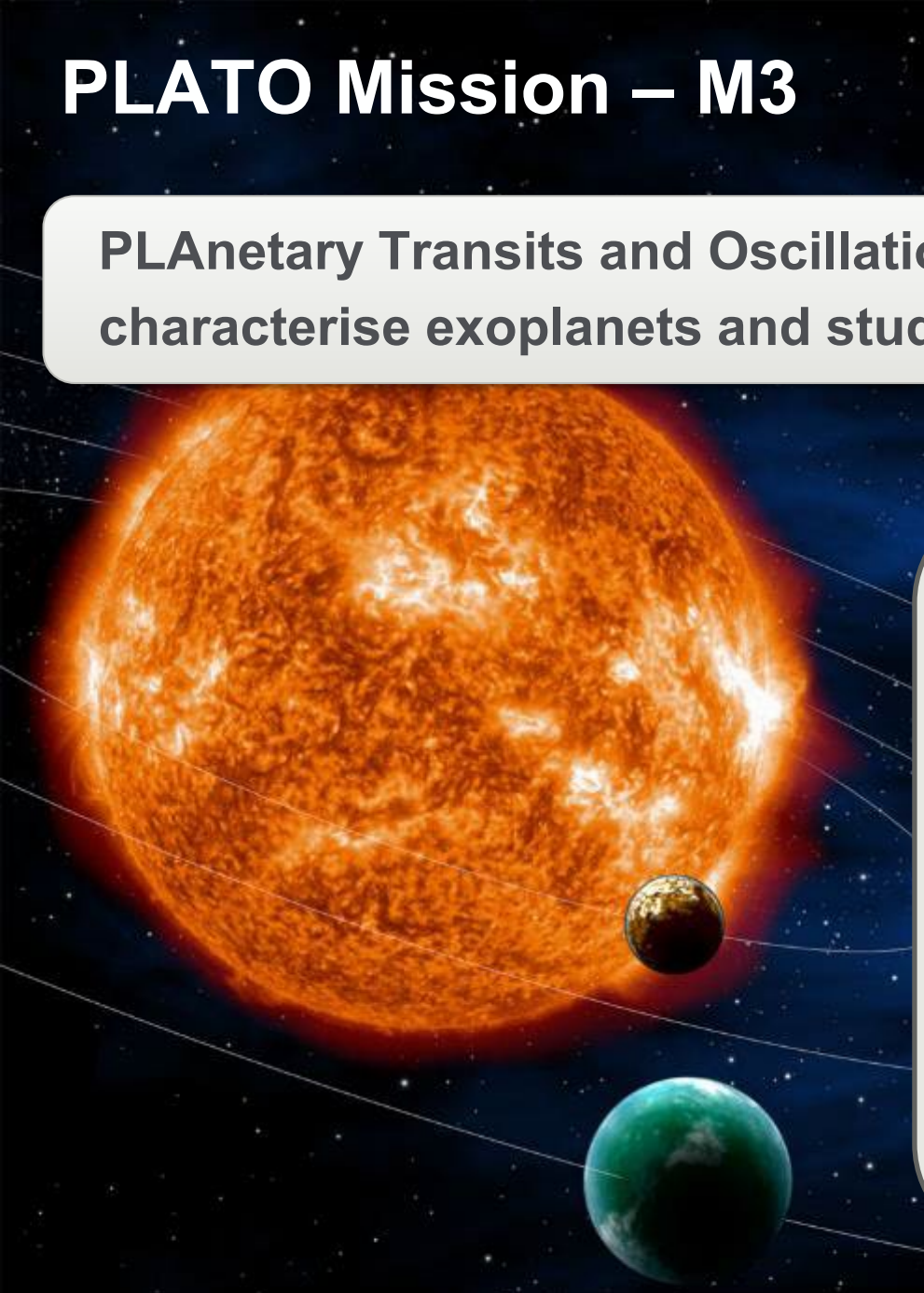
SPACECRAFT STATUS

PAYLOAD STATUS

Mission Overview

PLATO Mission – M3

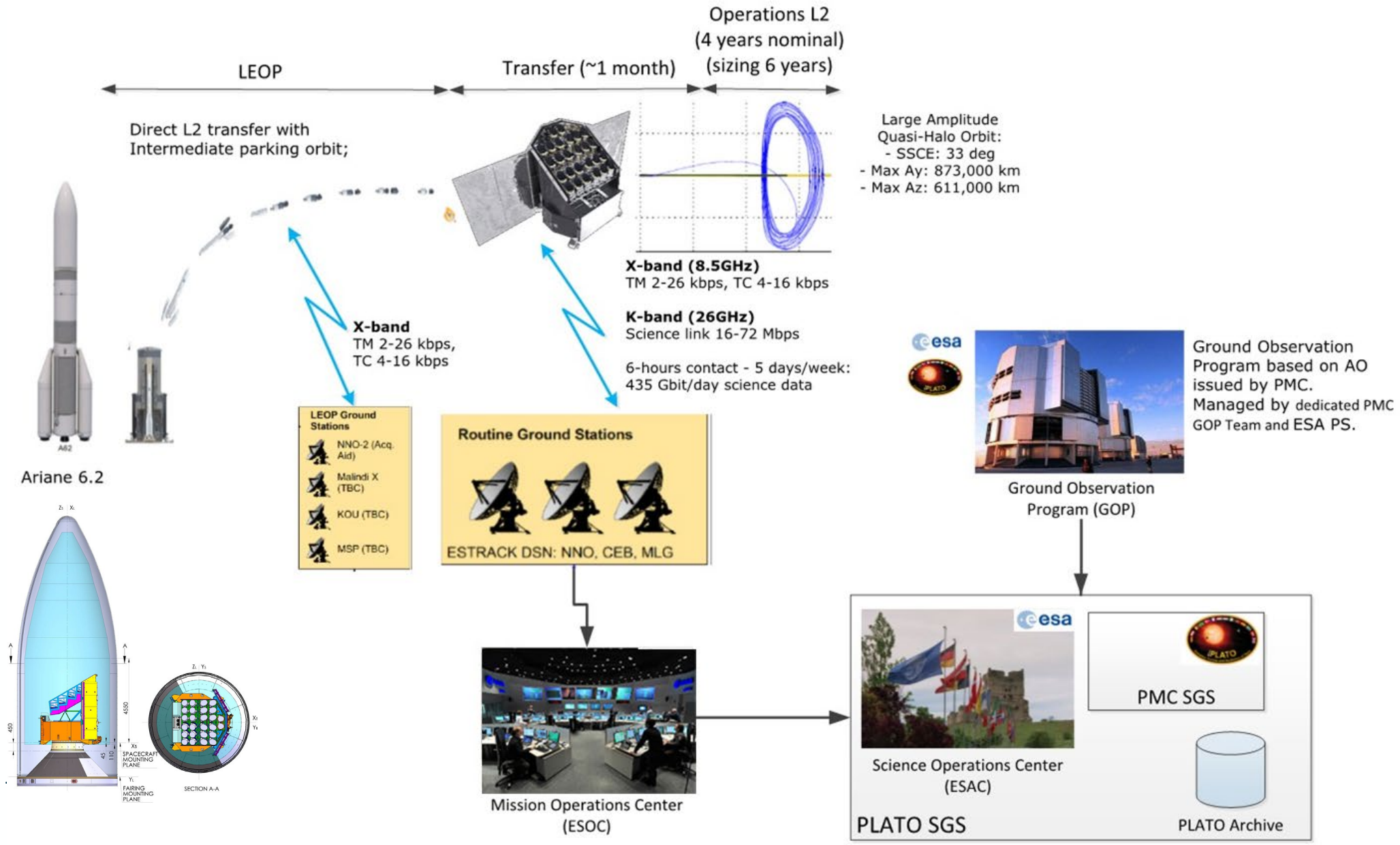
PLAnetary Transits and Oscillations of stars (PLATO) is a mission to detect and characterise exoplanets and study their host stars



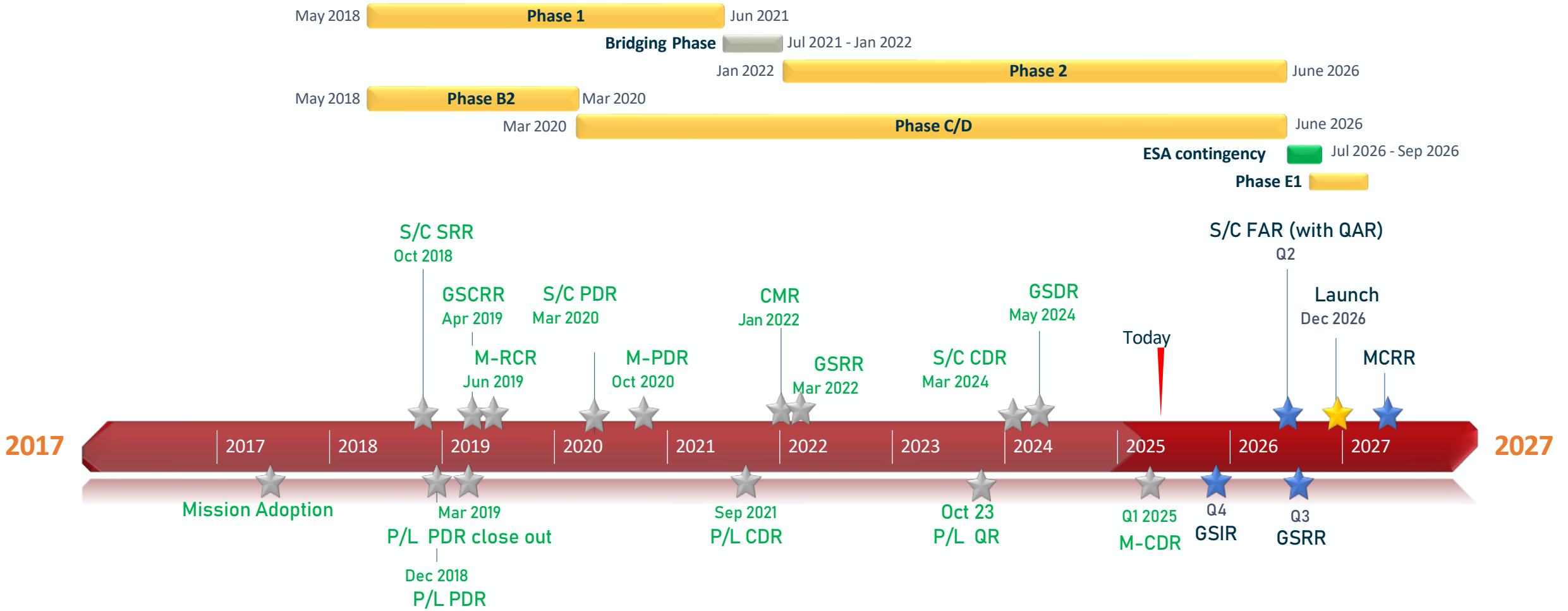
Focus on Earth-size planets in orbits up to the habitable zone of bright Sun-like stars to address 3 main questions:

1. How do planets and planetary systems form and evolve?
2. Is our Solar system special or are there other systems like ours?
3. Are there potentially habitable planets?

PLATO Mission Architecture

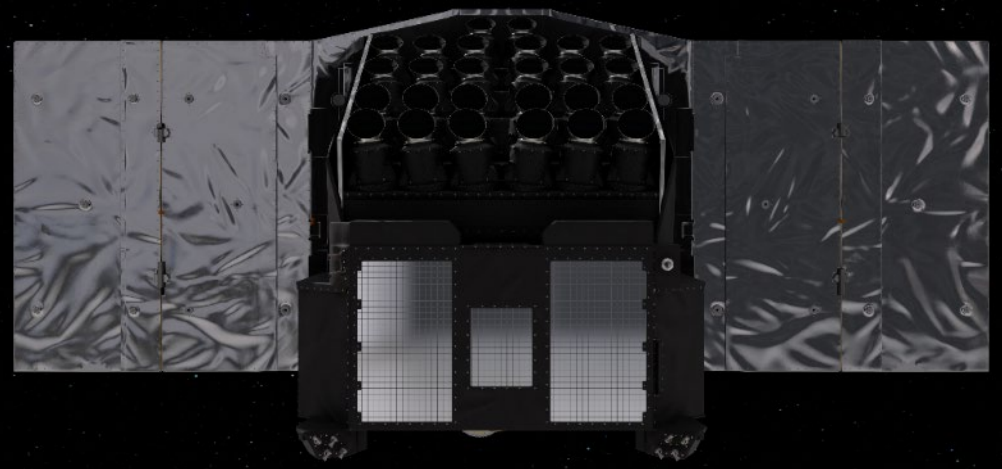


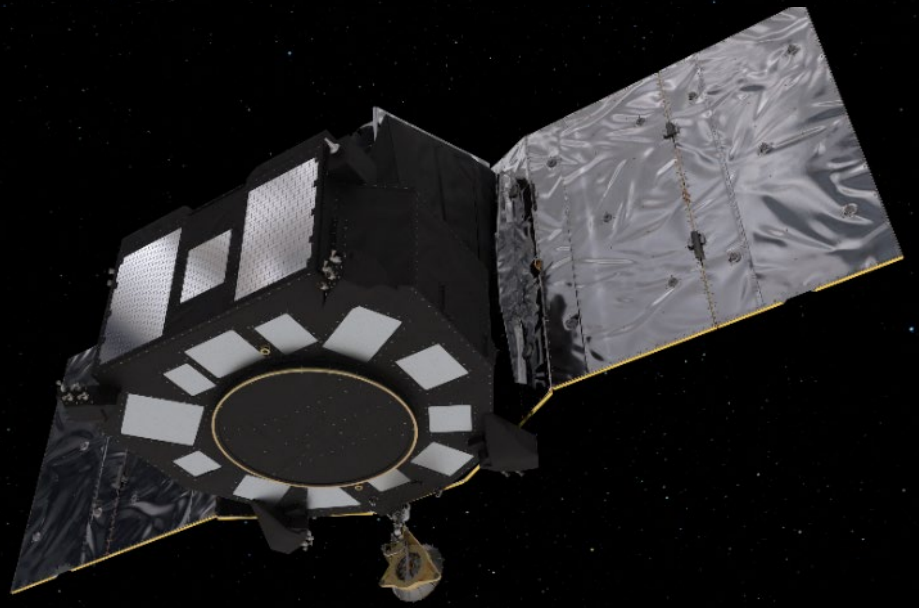
PLATO Milestones Status



Spacecraft Status

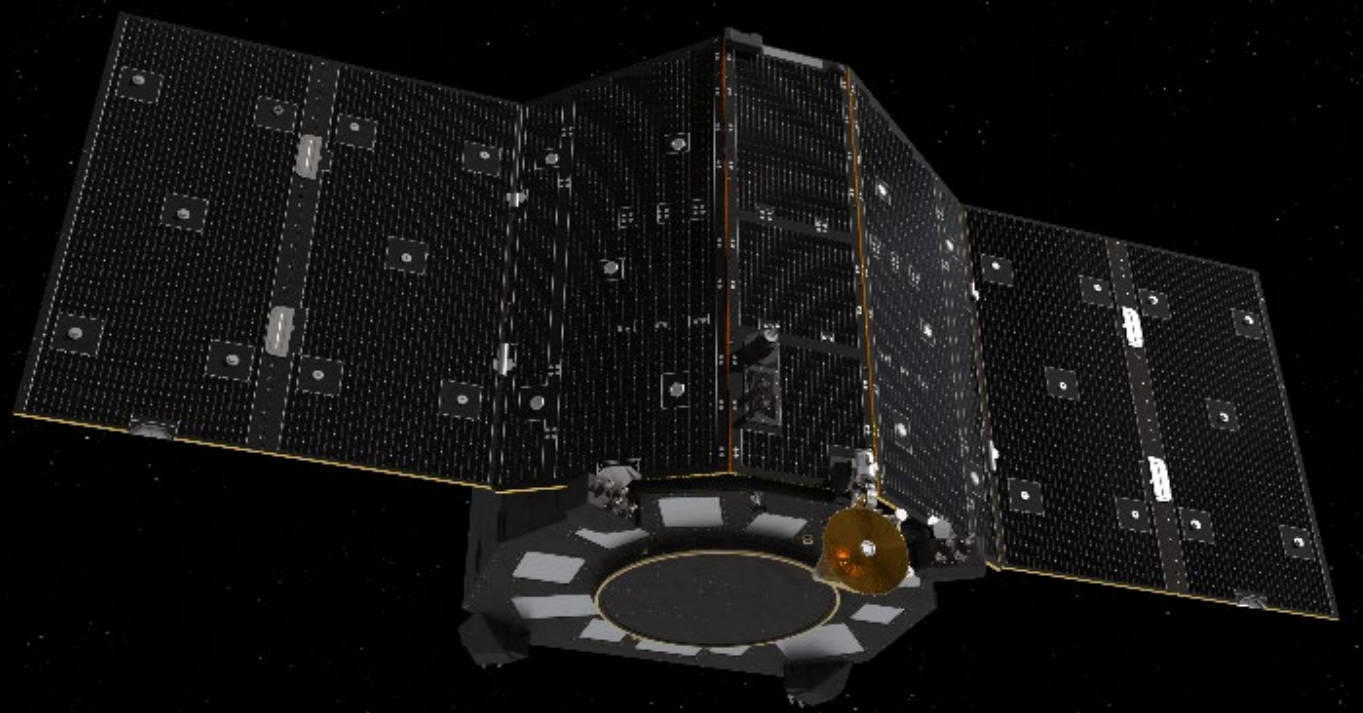
PLATO Space Segment





Spacecraft mass and power generation:
2213* kg Spacecraft at launch (w/o system margin)
2595 kg Launcher Performance (SRD and SC sizing mass)
2799 W min available power from SA for nom science ops
vs 2629W max power required (incl. 15% sys margin)

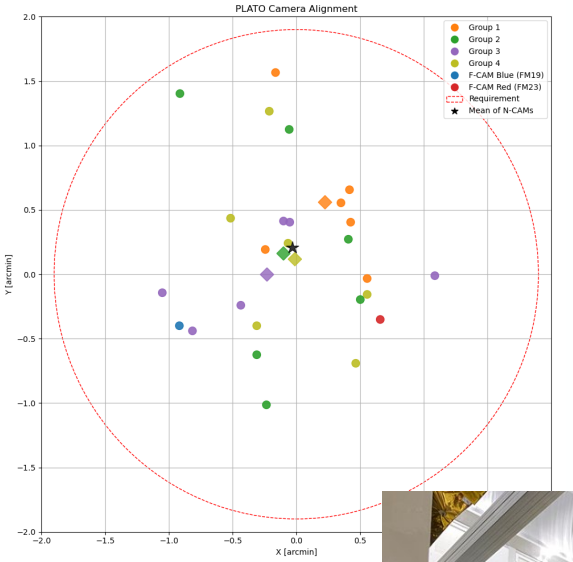
*including 80 kg LVA and 172.5 kg propellant and 10 Kg balancing mass



PLATO – Spacecraft Status

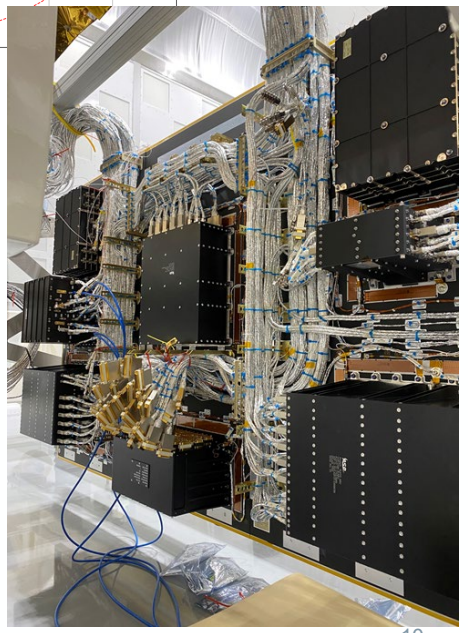
- SVM-PLM mating successfully performed → delivery to ETS (at ESTEC) beginning of September 2025
- Sunshield/Solar Array subsystem fully integrated
  - environmental test campaign & deployment test successful
  - final inspections ongoing
  - delivery to ETS beginning of August
- Start of spacecraft environmental test campaign end Oct-25
- Spacecraft planning still has 3 months margin on Dec-26 launch

PLATO – Spacecraft PFM Hardware in OHB

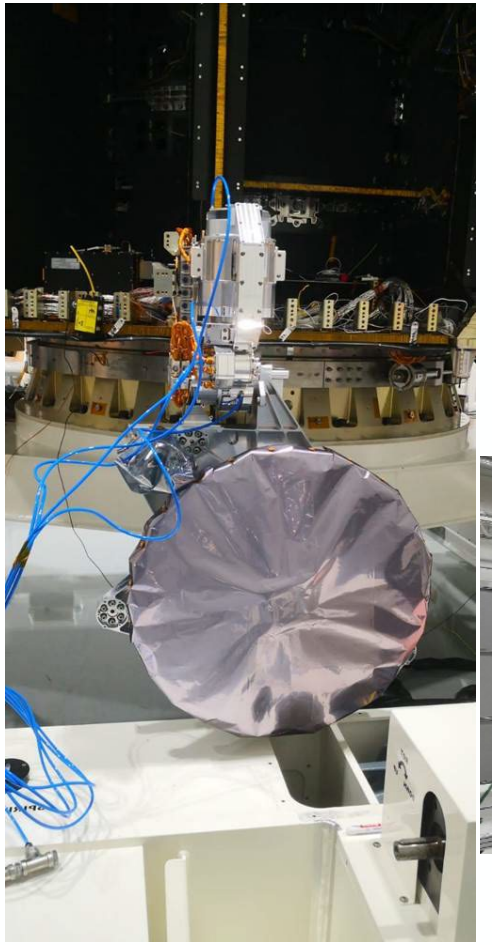


Payload Module with all N-and F-CAMs installed at OHB Oberpfaffenhofen ISO5 cleanroom

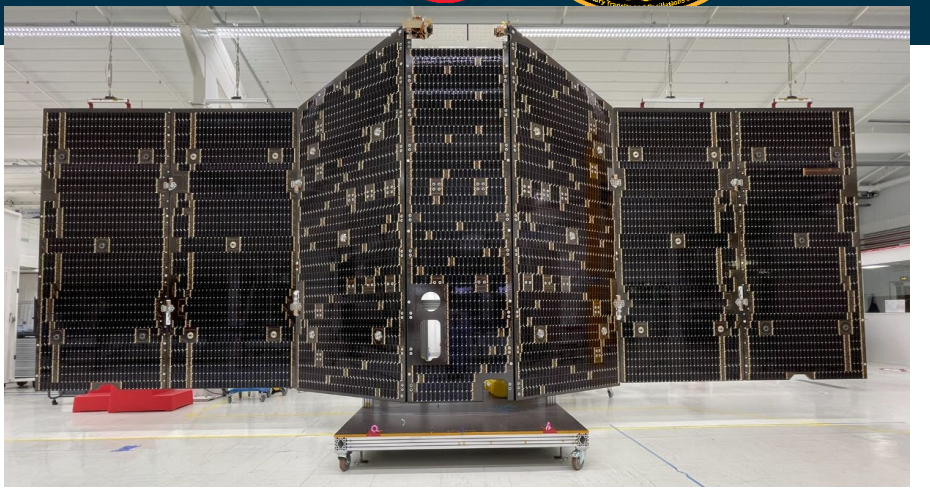
Payload Electronic Panel

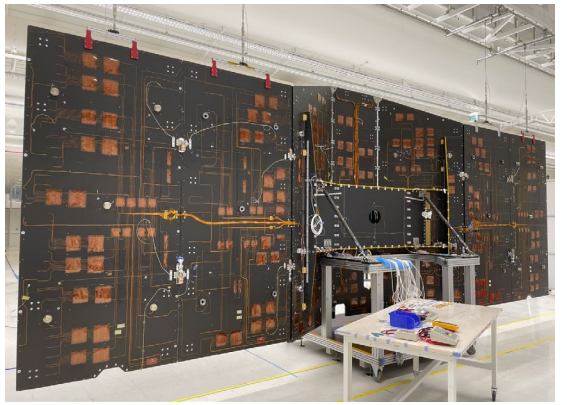


PLATO – Spacecraft PFM Hardware



Service Module now at OHB

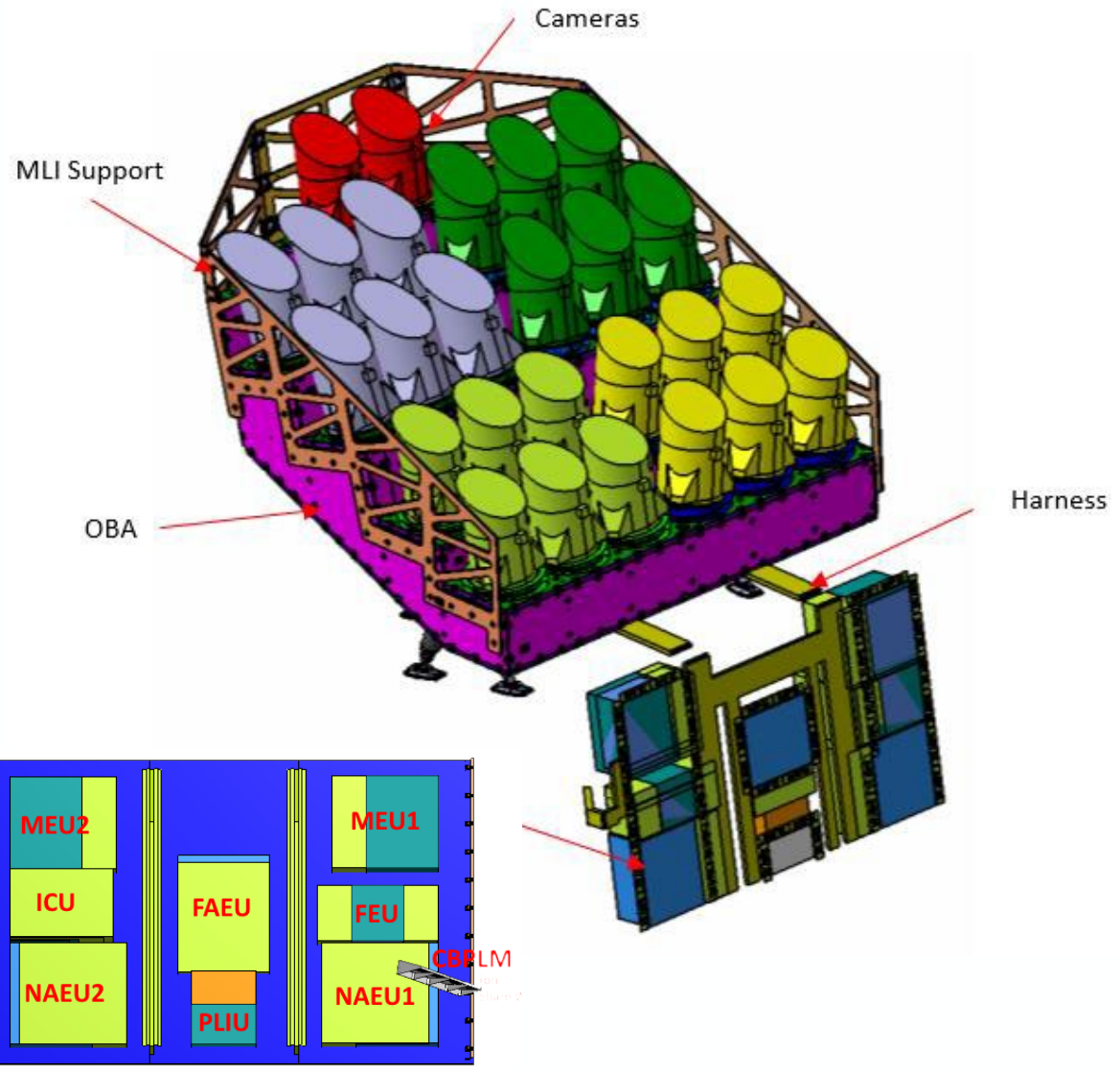


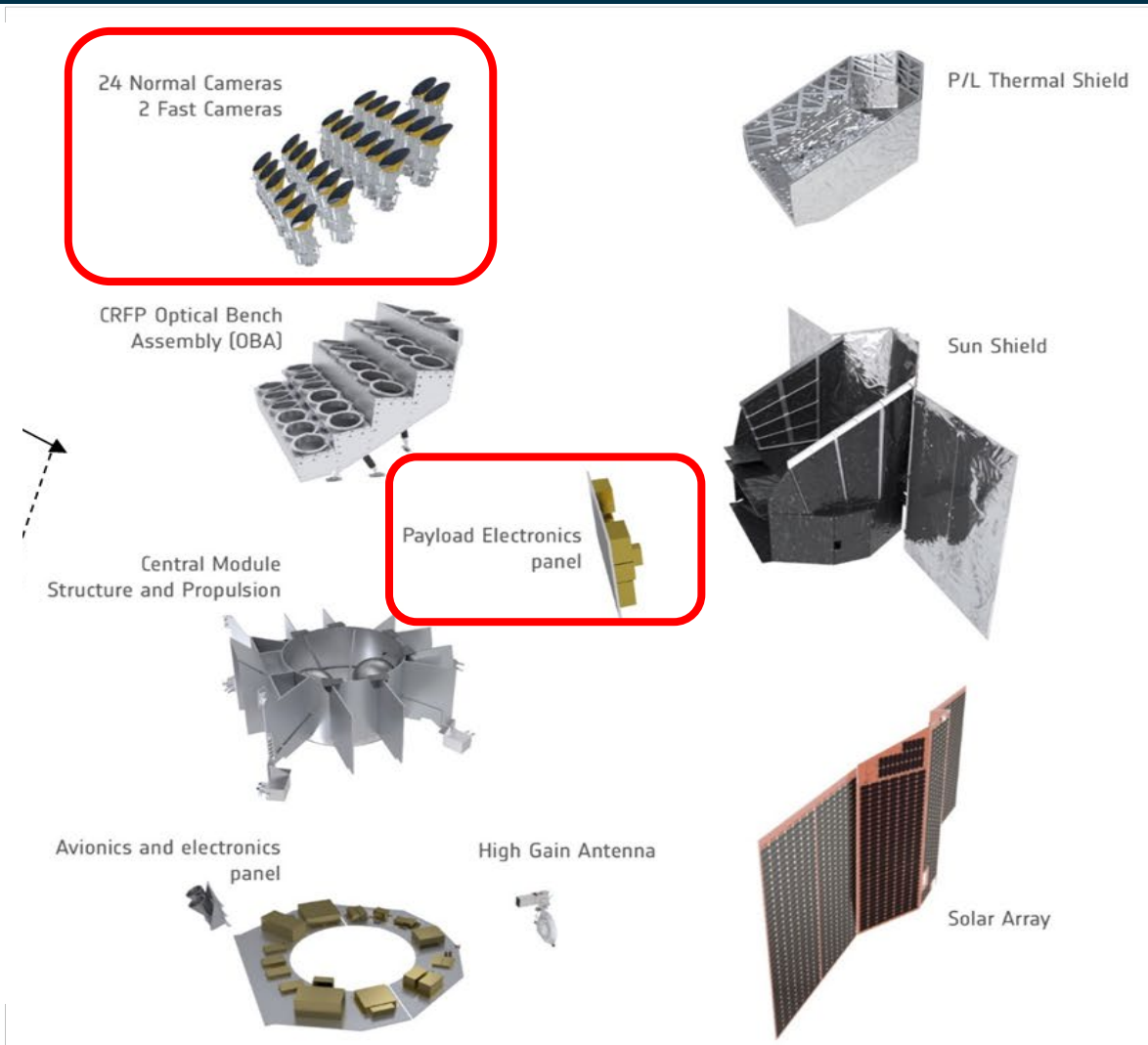


Sunshield/Solar Array

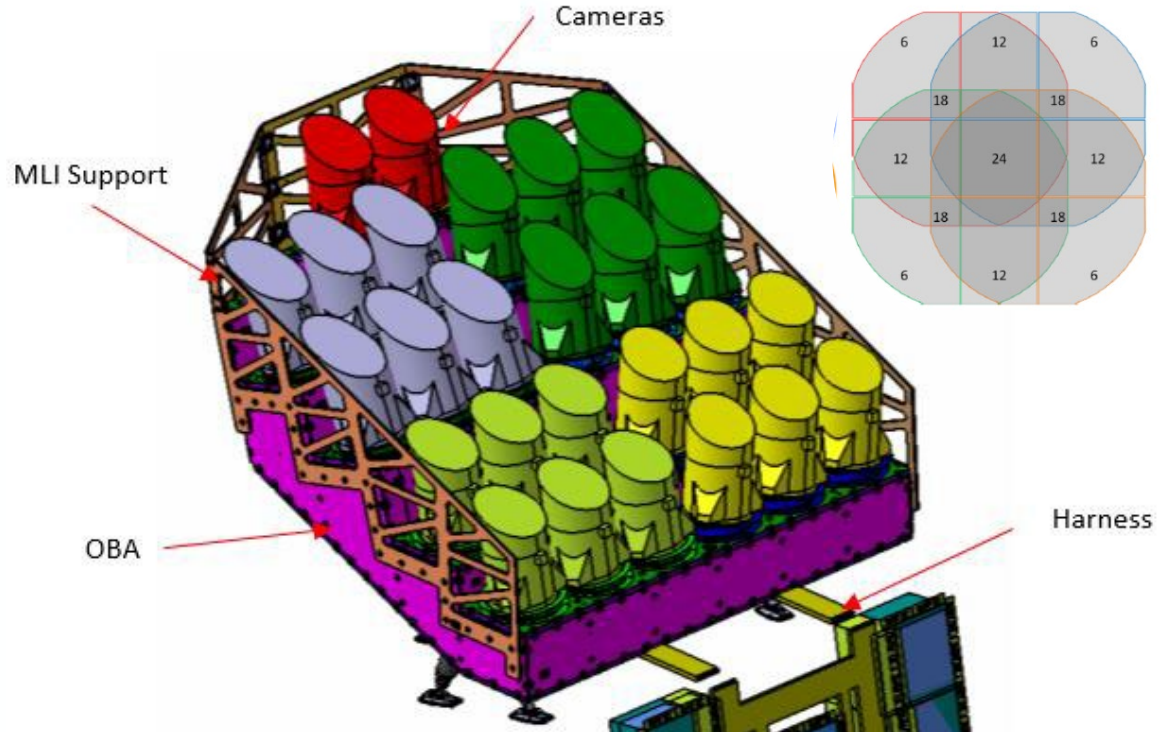
Payload Status

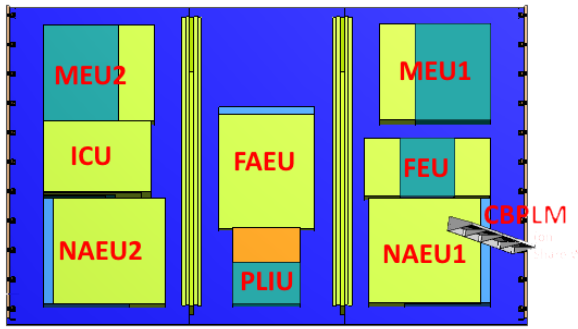
Payload Module Overview (1/2)





Payload Module Overview (2/2)





Instrument concept

- Wide Field-of-View and large photometric dynamic range to maximise the number of observable stars
- Multi-telescope configuration with CCD-based focal planes in the visible wavelength

CAMERA Subsystem (CAM)

- 24 almost identical “normal” cameras (N-CAM)
- 2 “fast” cameras (F-CAM) for observation of brighter stars and Fine Guidance Sensor capabilities (AOCS)
- Ancillary Electronic Units (2x N-AEU & 1x F-AEU)

Data Processing Subsystem (DPS)

- Main Electronic Units (2x MEU) for N-CAMs
- Fast Electronic Unit (FEU) for F-CAMs
- Instrument Control Unit (ICU)

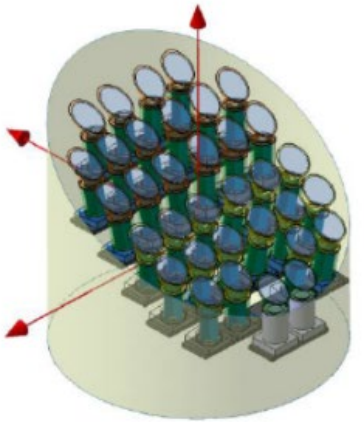
PLATO Payload Overview

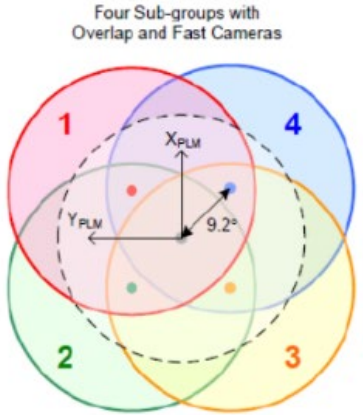
Driving payload requirements

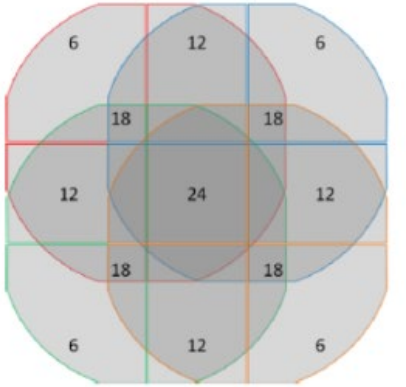
- Optimization of Field-of-view to maximize number of bright stars observed simultaneously
- Photometric accuracy (signal-to-noise and resolution) needed to detect Earth-sized planets and photometric dynamic range (bright stars with apparent magnitude mv<11 as well as fainter stars down to mv=16)
- Attitude performance, stability and knowledge to reduce error in the measured light-curves
- Level of on-board processing to limit data volume
- Ground segment processing requirements and algorithms for data reduction
  - 4 Groups of 6 normal cameras
  - Each group with same FoV and 9.2 degrees off-set w.r.t payload module axis,
  - FoV ~ 2250 deg2 (~ 47 degrees x 47 degrees), the central area being observed by all 24 cameras
  - Two fast cameras used as Fine Guidance Sensor (FGS) in AOCS (performances much better than standard star trackers)

Payload configuration

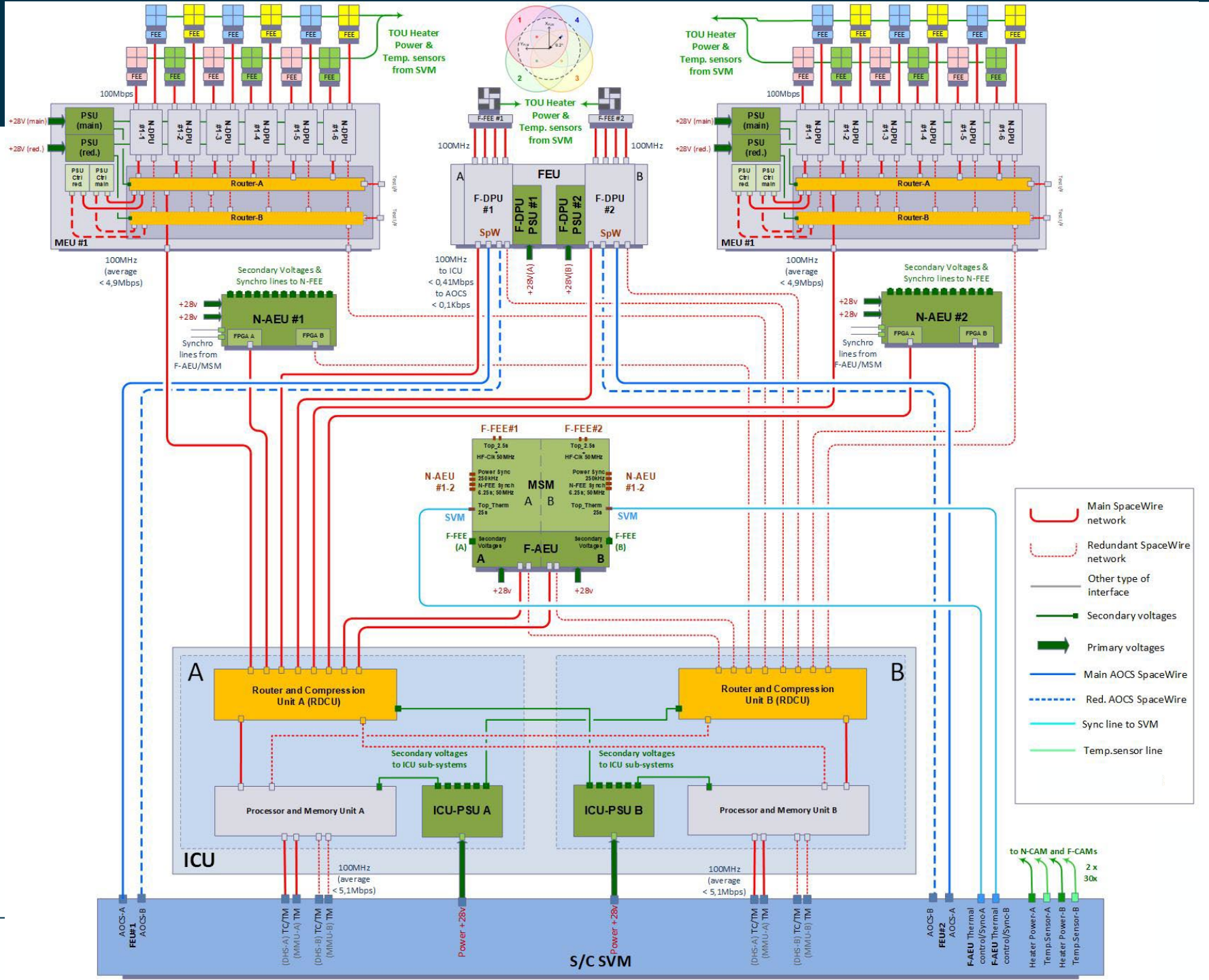
- Multi-telescope configuration with 24 'normal' cameras with CCD-based focal planes, in the visible wavelength range (500-1000 nm)
- Normal cameras monitor stars of magnitude mv >8 (cadence of 25 s)
- Two 'fast' cameras observe brighter stars (mv ~ 4-8) at high cadence (2.5 s)







Architecture



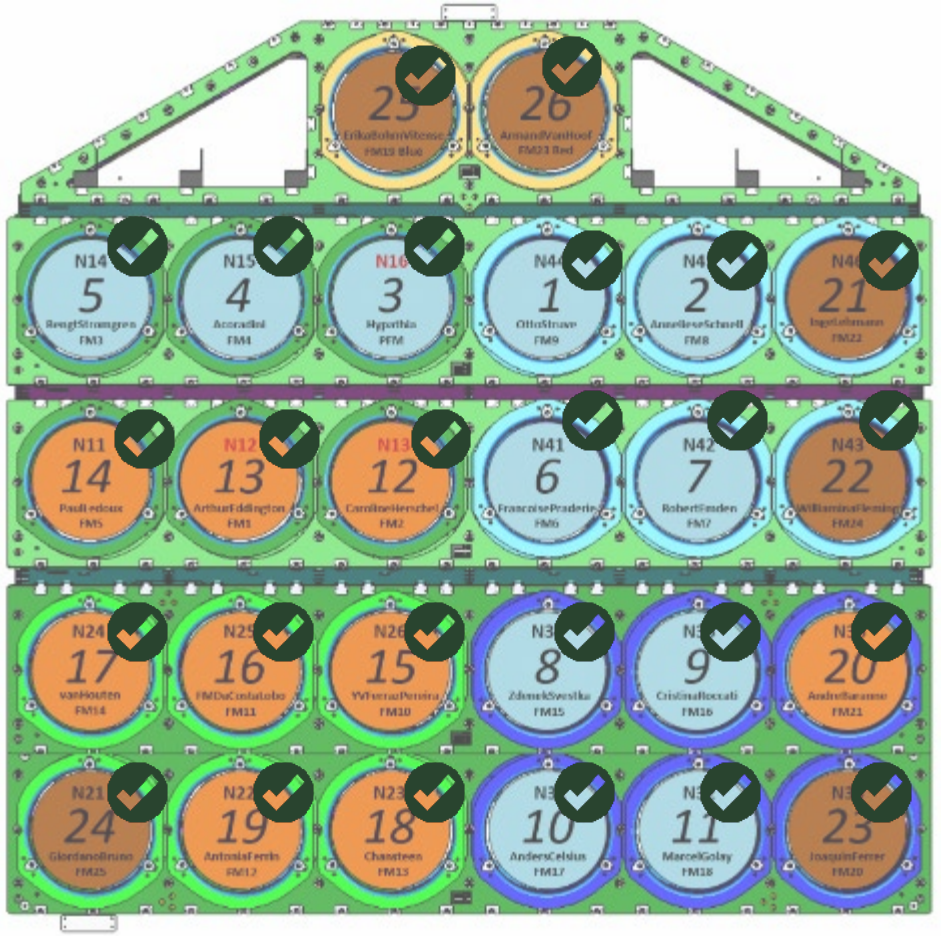
PLATO Payload Status Highlights

- Excellent progress on finalization of flight hardware
  - Normal Camera program AIT completed end of 2024
  - Fast Camera program AIT completed May 2025
  - DPS units: EQM units delivered; PFM/FM units delivered
  - DPS EQM bench installed: DPS ASW v1.0 delivered.
  - DPS SW delivery to Prime: DPS ASW v1.0 delivered

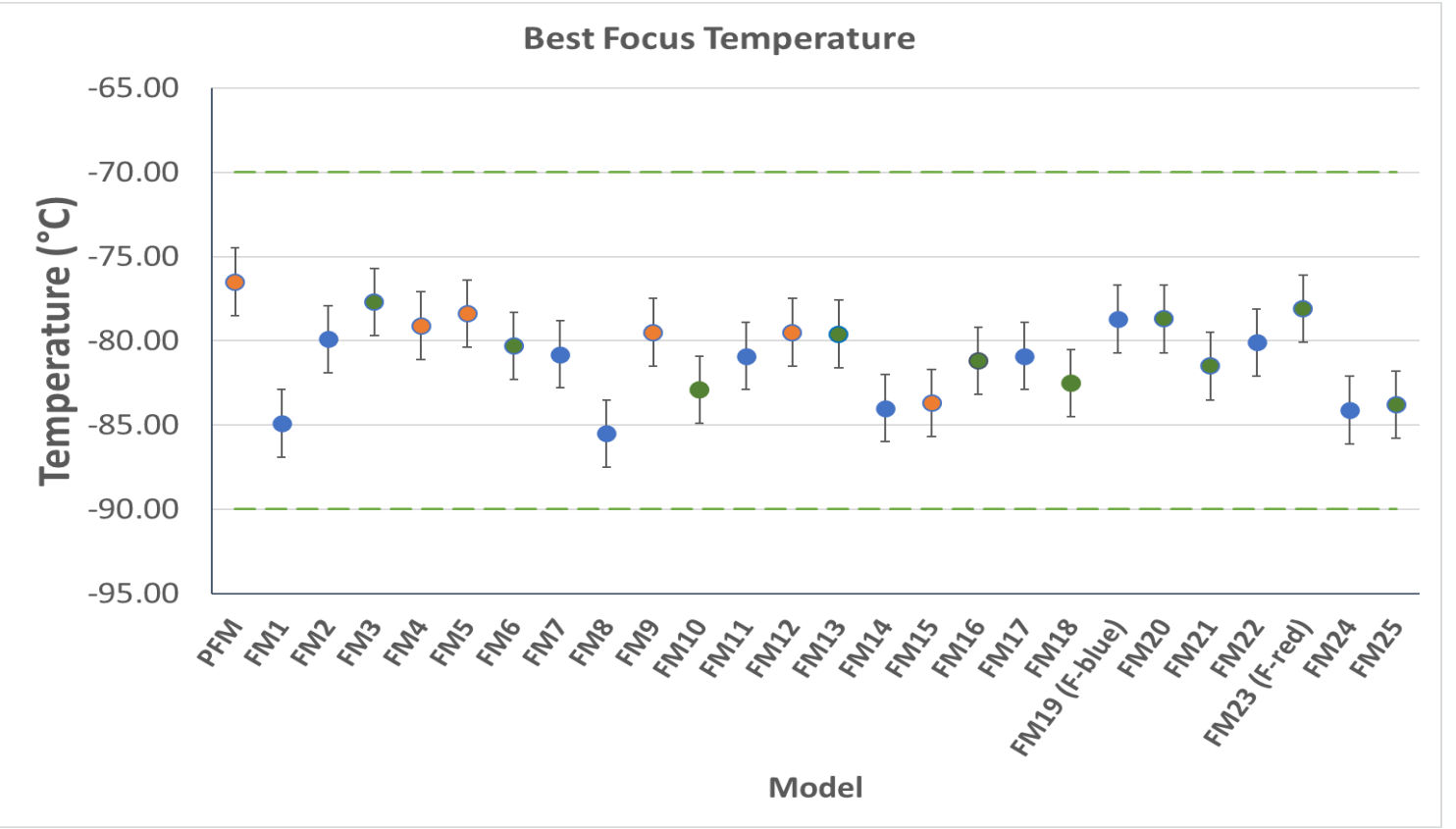
- Delivery targets all reached
  - All payload hardware delivered in 2025

- Remaining hardware work:
  - Camera Flight Spares
  - DPS unit spares

PLATO Camera status

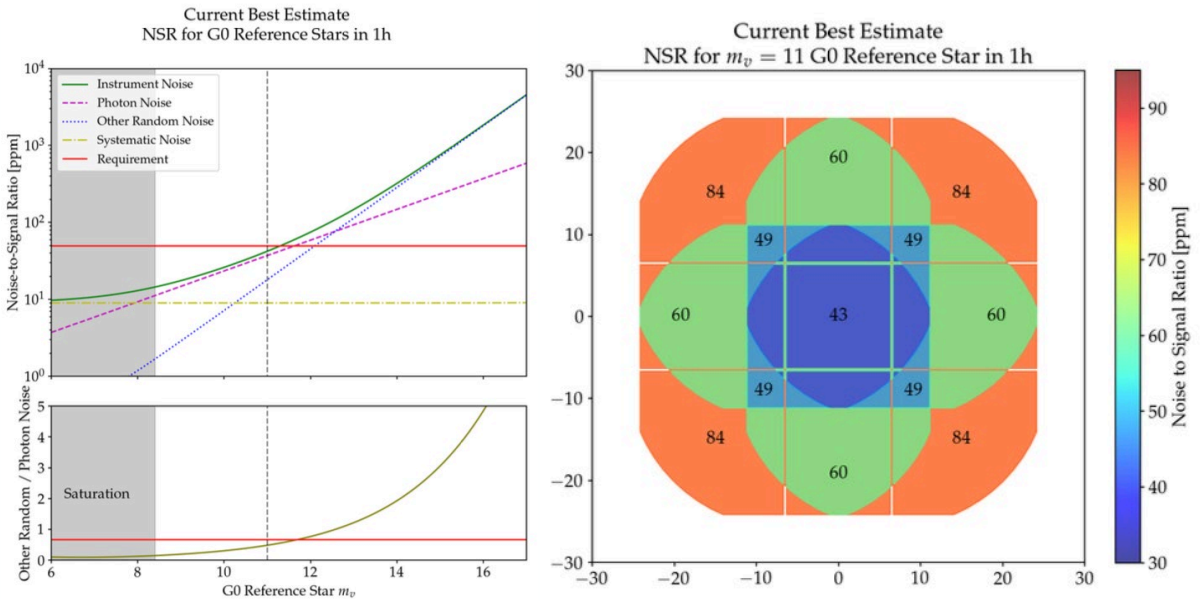


- All (24) N-CAMs and (2) F-CAMs tested, delivered to OHB prime and installed on OBA within pointing spec.



Performance Verification

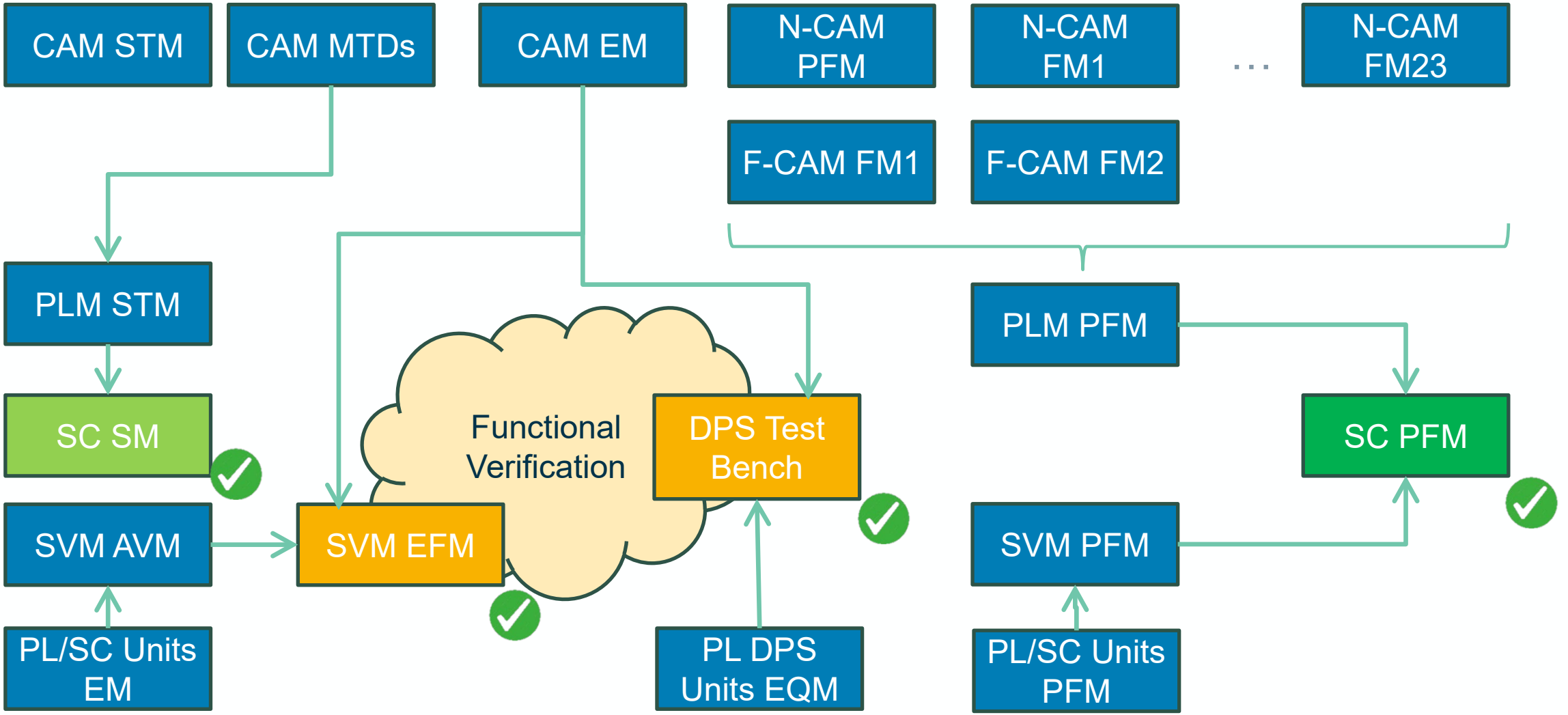
- Good performance status → verified by test on flight hardware
- Instrument and performance compliant to Mission Requirements



Requirement	Short Description	Compliance and References
MRD-GEN-050	mission reliability > 0.7	C, see [RD 15] and [RD 16]
MRD-MIS-020	spacecraft in L2	C, Sections 3.1 and 3.2
MRD-MIS-050	observe sky fields of 2232deg^2	C, see [RD 4]
MRD-MIS-070	light curves in band of $[500, 1000]$ nm	C, see [RD 4]
MRD-MIS-120	Mission performance after nominal science	EoL Constraint
MRD-MIS-130	≥ 7500 type F5 to K7 stars of $m_v < 11$	C, see [RD 10] and Section 7
MRD-MIS-140	Sample 1 random noise < 50 ppm/hr	C, Sections 4.1, 7.5, and [RD 4]
MRD-MIS-150	light curve duration sample 1	C, Sections 1.4.1 and 6
MRD-MIS-160	maximise number of $m_v \leq 10.5$ in sample 1	C, see [RD 8], [RD 11] and [RD 10]
MRD-MIS-170	≥ 500 type F5 to K7 stars of $m_v < 8.5$	C, see [RD 10] and Section 7
MRD-MIS-180	sample 2 random noise	C, Section 4
MRD-MIS-190	light curve duration sample 2	C, Sections 1.4.1 and 6
MRD-MIS-200	two color information	C, see [RD 4]
MRD-MIS-210	≥ 2500 cool late type dwarfs of $m_v < 16$	C, see [RD 10] and Section 7
MRD-MIS-230	light curve duration sample 4	C, Sections 1.4.1 and 6
MRD-MIS-240	≥ 122500 type F5 to K stars of $m_v < 13$	C, see [RD 10] and Section 7
MRD-MIS-250	centroids for at least 5% of sample 5	C, [RD 10] and Section 7
MRD-MIS-260	≥ 4500 imagettes type F5 to K stars of $m_v < 13$	C, [RD 10] and Section 7
MRD-MIS-270	light curve duration sample 5	C, Sections 1.4.1 and 6
MRD-MIS-280	observe targets from the GO programme	C, Section 7
MRD-MIS-290	average of 8% of telemetry to GOs	C, Section 7
MRD-MIS-340	≥ 150 2.5s imagettes in two colours	C, see [RD 4] and Section 7
MRD-MIS-370	instrument random noise (non-photonic)	C, Section 4.1 and [RD 4]
MRD-MIS-380	max mean residual error 20μHz - 40mHz	C, Section 4.2
MRD-MIS-390	max mean residual error $< 20\mu$Hz	C, Section 4.2
MRD-MIS-400	measurement gaps $< 7\%$ in any one year	NC for baseline, C for optimised scenario, see Section 6
MRD-MIS-410	first sidelobe $< 1\%$ and separated by $\geq 70\mu$Hz	C, Sections 4 and 6
MRD-MIS-430	on-ground and in-flight calibrations	C, see [RD 4], [RD 12], and [RD 14]
MRD-MIS-440	microscanning, PSF to sub-pixel resolution	C, see [RD 12] and [RD 13]
MRD-MIS-450	full frames and uplink	C, Section 7
MRD-OPS-200	6 hours ground contact 5 days per week	C, Sections 3.3 and 7 but see discussion in 6.2 for required flexibility during 90-degree rotation
MRD-OPS-300	casualty risk less than 1 in 10k	C, Section 3.4
MRD-OPS-310	disposal orbit $\Delta v \geq 10$m/s	C, Section 3.4

Table 2-1: Mission performance requirements including compliance statements.

Payload Development Cycle



Remaining Key Payload Activities

- **CAM System**:
  - Flight Spares production and testing
  - Verification Control Boards
  - Formal delivery of hardware to ESA (finalisation of End Item Data Packages & DRBs)
- **DPS System:**
  - Flight spare inventory
  - Verification Control Boards
  - Closeout of unit QRs, ARs and DRBs
  - DPS SW v1.2 (final version) development
  - On-Board Control Procedures (OBCP) development continuation and finalisation
- Support to Spacecraft Full Functional Test activities and environmental test campaign preparations
- Ship to launch site and launch preparations
- Launch : December 2026

PLATO Payload Space Segment: Organisation

PLATO Payload provided as a collaboration between ESA and the PLATO Mission Consortium (PMC)

End presentation