EUCLID Definition Study Status

1. **Mission overview**
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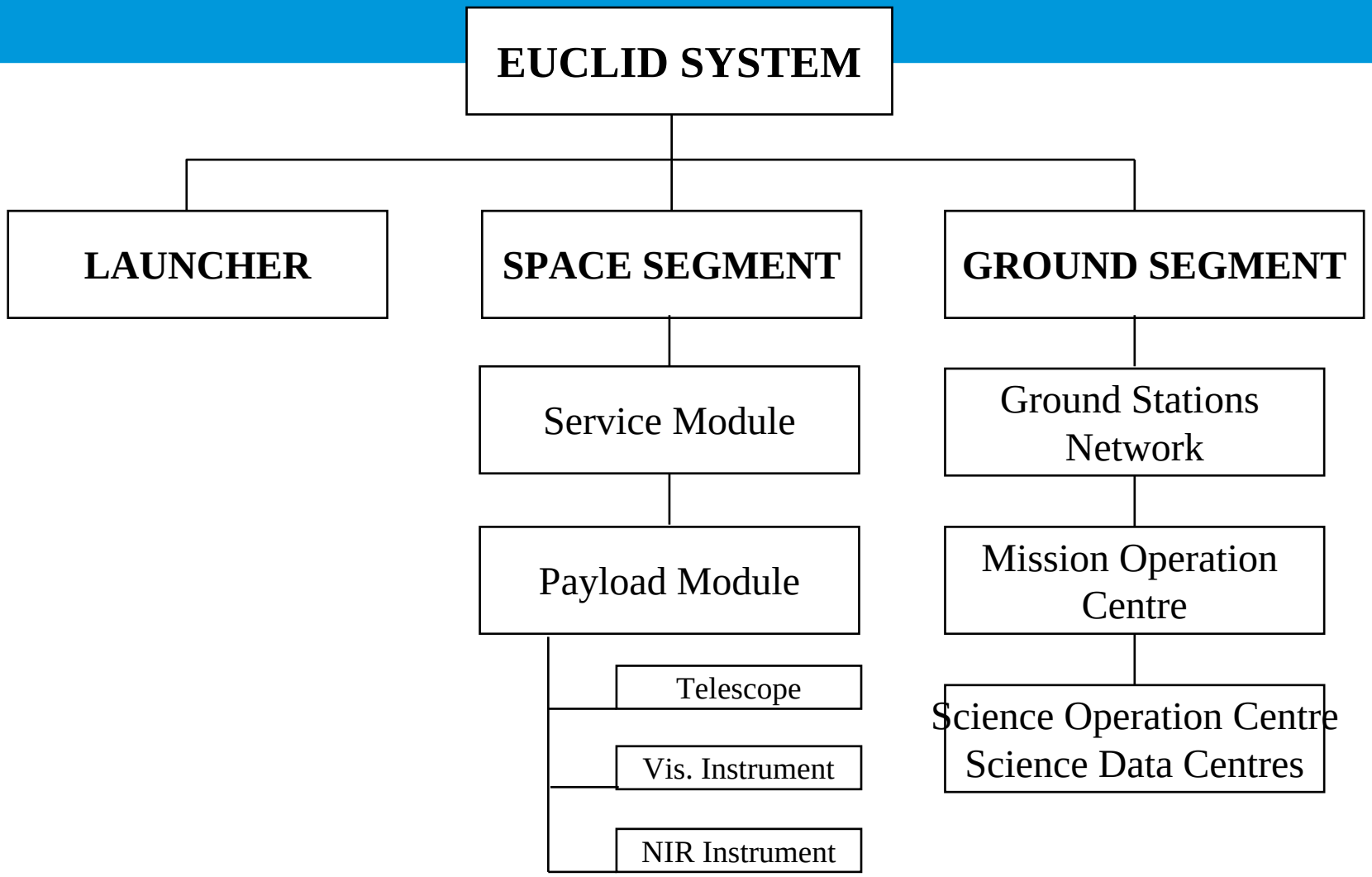
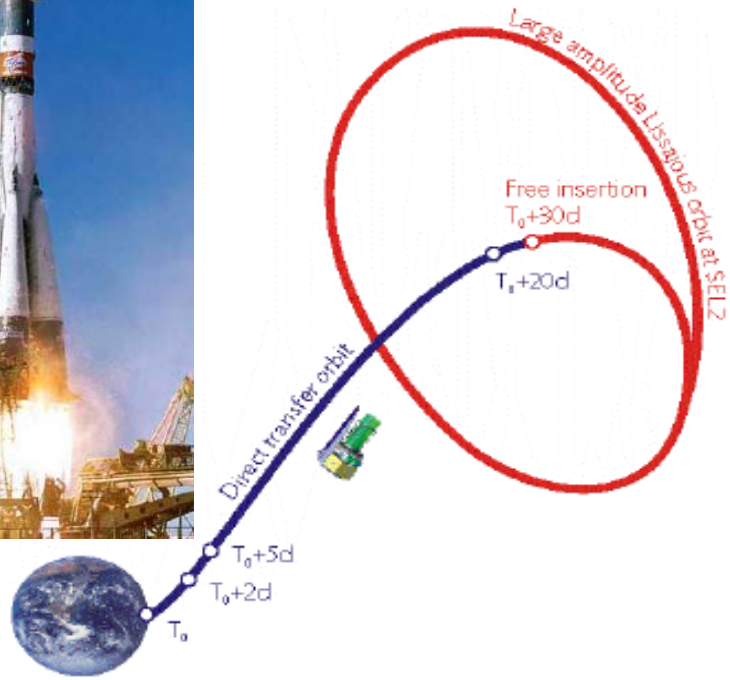
4. Summary

EUCLID Product Tree



EUCLID Launcher

- Launcher: Soyuz ST2-1B from Kourou
- Direct injection into tranfer orbit
  - Transfer time: 30 days
- Launch vehicle capacity:
  - 2160 kg (incl. adapter)
  - 3.86 m diameter fairing
- Launch: 2019
- Mission science operation duration: 6.0 years



EUCLID Ground Segment

- Mission Operation Centre
  - at ESOC (Darmstadt, Germany)
- Science Operation Center
  - at ESAC (Villafranca, Spain)
- Ground Stations:
  - Cebreros and Malargue antennas
  - Daily science communication:

    ~ 850 Gbits in K band (26 GHz)
  - Command and control in X band

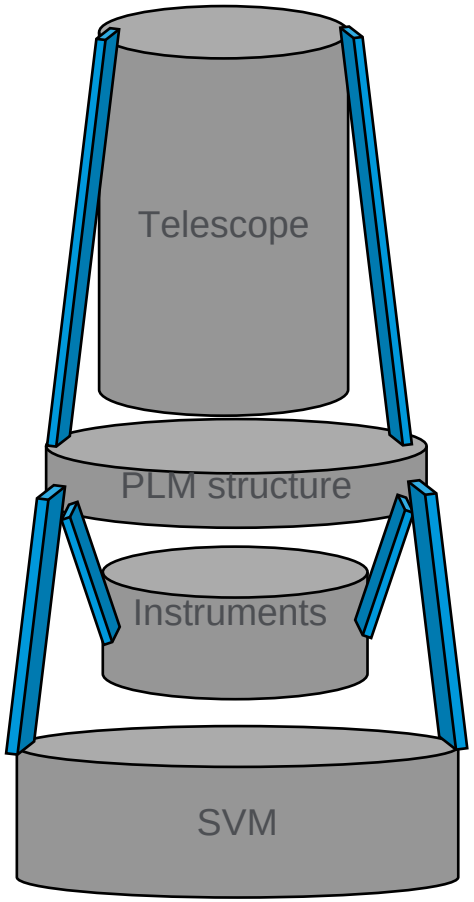
EUCLID Space Segment

The payload module consists of:

- A single telescope
- A visible imager (VIS),
- A near-IR instrument (NISP)

The service module consists of:

- S/C Structure
- Thermal control subsystem
- Propulsion subsystem
- Attitude and Orbit Control subsystem
- Communication subsystem
- Power subsystem
- Data handling subsystem

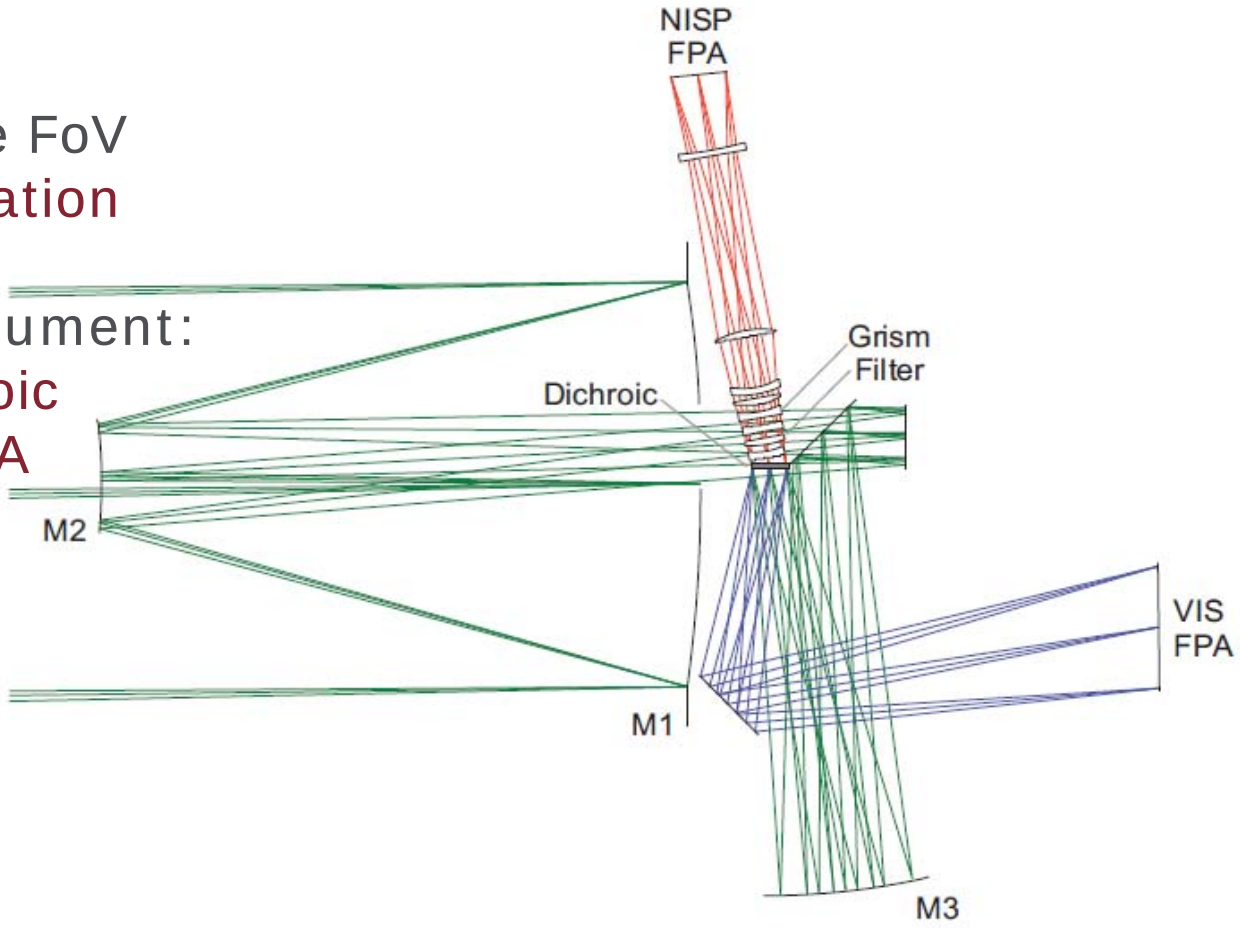


EUCLID telescope optical design

Telescope design: Korsch
1.2 m primary

VIS and NISP share same FoV
Dichroïc separation

Interfaces telescope/instrument:
NISP: at dichroic
VIS: at VIS FPA



→ Optical design imposed by ESA based on Consortium input

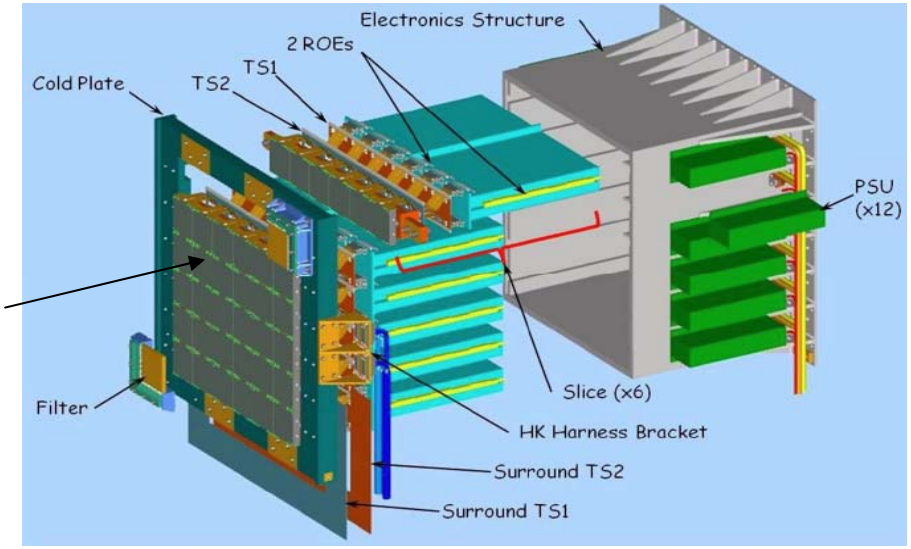
VIS Instrument

Name	UNIT	Function
VI-FPA	VIS Focal Plane Assembly	Detection of visible light for imaging
VI-RSU	VIS Shutter	Close VIS optical path for read out Close VIS optical path for dark and flat field calibration
VI-CU	VIS Calibration Unit	Illuminate the FPA with Flat Field for calibration
VI-CDPU	Control and Data Processing Unit	Control Instrument Perform data processing Interface with Spacecraft for data handling
VI-PMCU	Power and Mechanism Control Unit	Control Units
VI-FH	Flight Harness	Connection of units

113 kg mass allocation; 252 W max power allocation

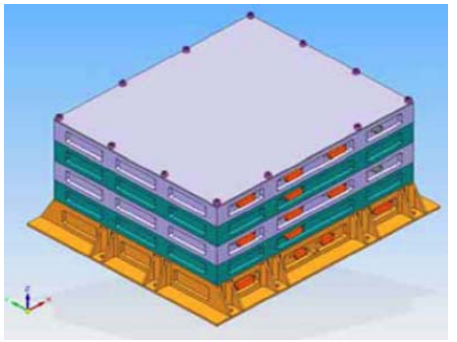
VIS Instrument

VI-FPA

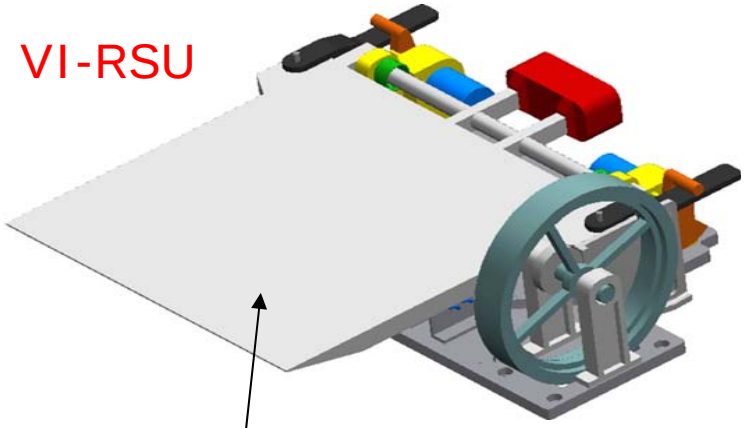


36 CCD's
(153 K)

VI-PMCU
(Power Mgt & Control Unit)



VI-RSU

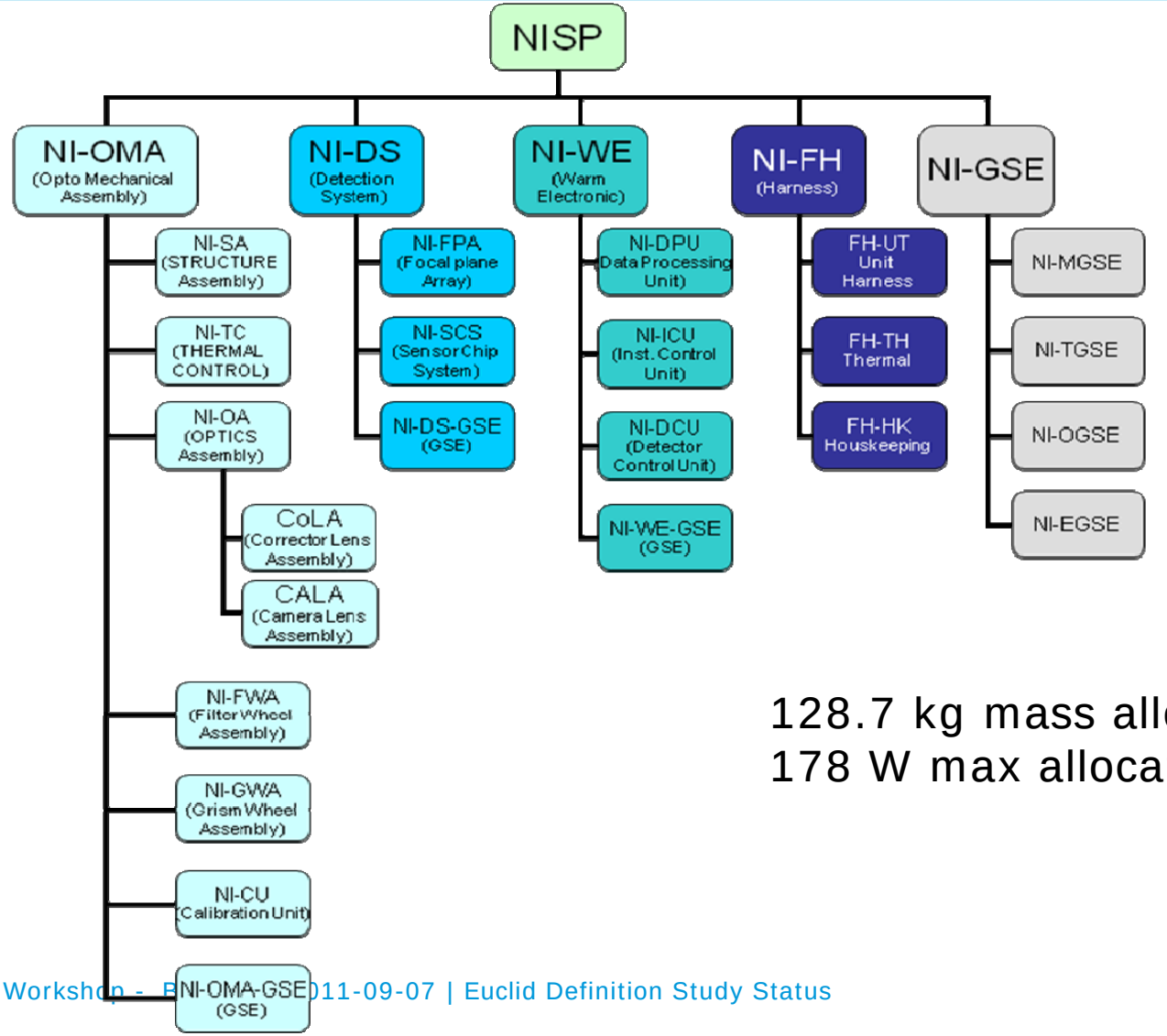


One leaf shutter

VI-Cal. Unit

VI-CDPU
(Command & Data Processing Unit)

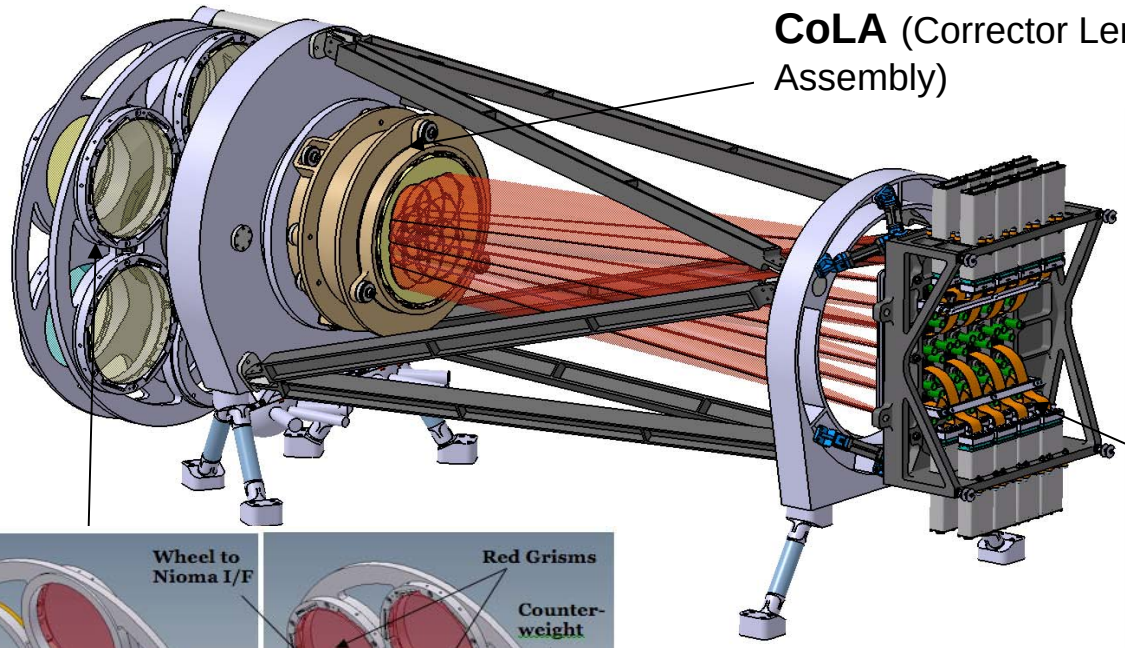
NISP Instrument

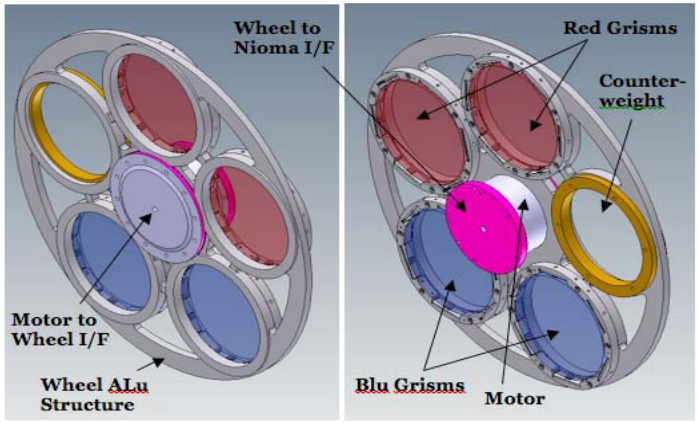


128.7 kg mass allocation
178 W max allocated power

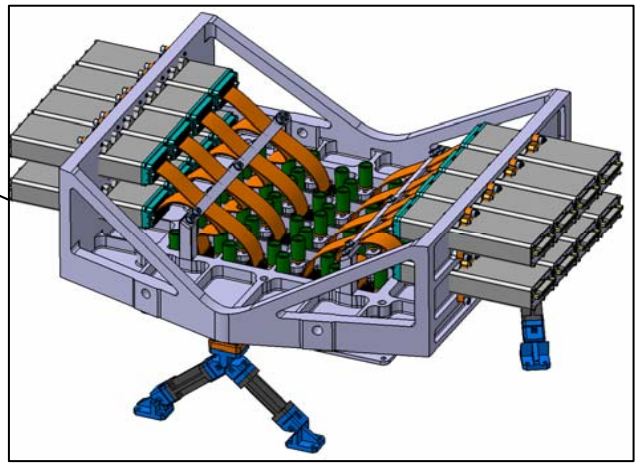
NISP Instrument

NI-OMA





NI-GWA + NI-FWA



NI-FPA
(16 detectors)

EUCLID mission operation concept

- Survey mission with 6 years nominal science operation duration.
- The wide extragalactic sky survey covers 15 000 deg2
- The deep survey covers 40 deg2 around ecliptic poles
- The 3 axis stabilized spacecraft is operated in step and stare mode (around the S/C sun axis) to observe galactic latitudes > 30 degrees.)

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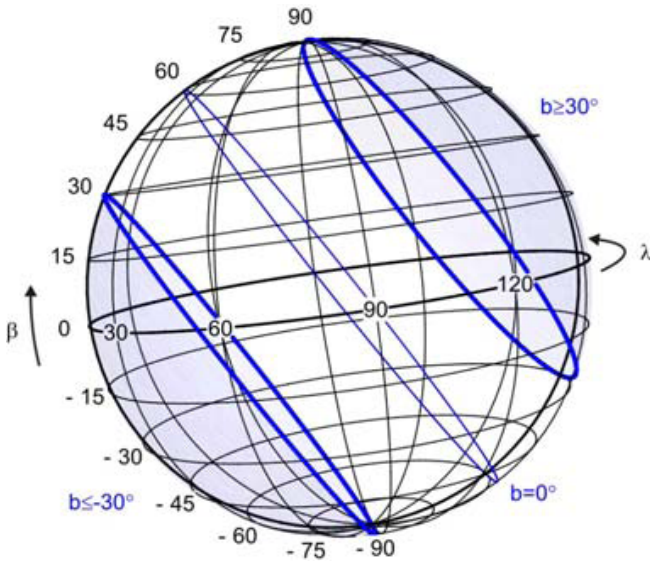
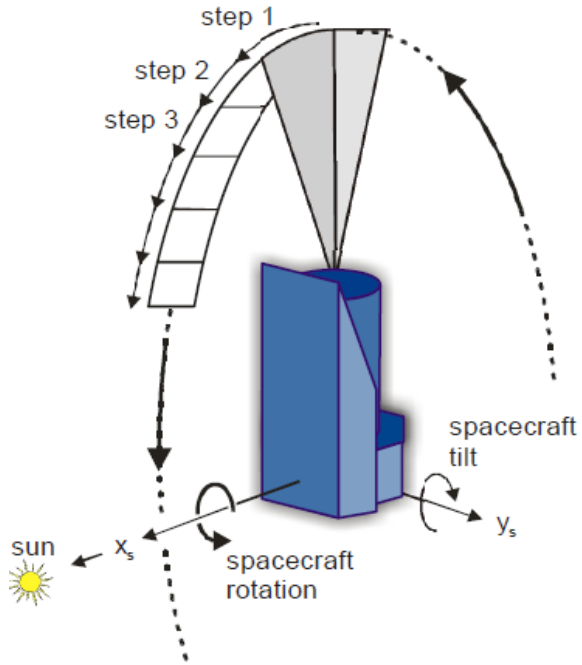




EUCLID mission operation concept

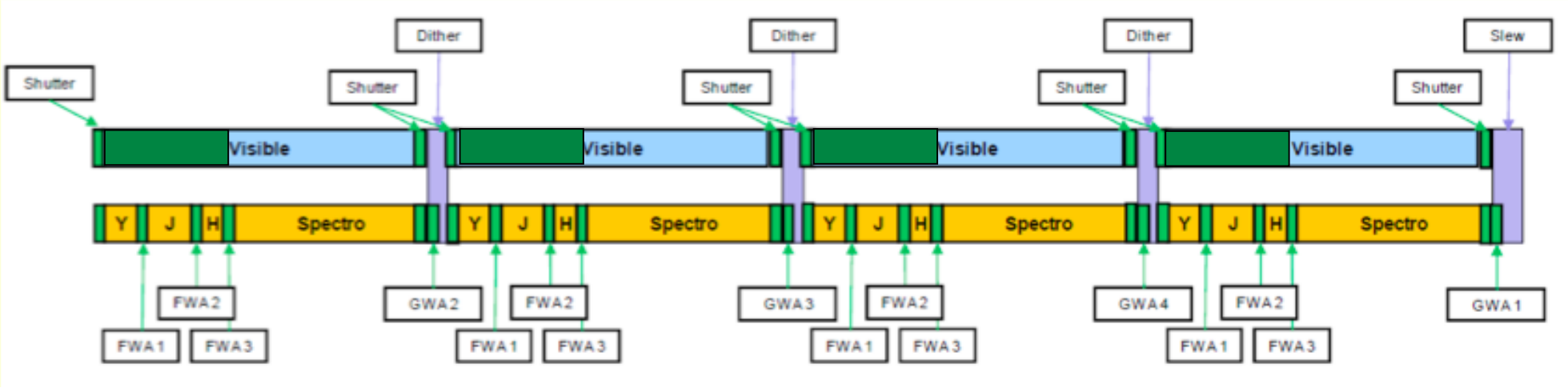
-For each field, 3 dithers are performed at Spacecraft level leading to a total of 4 dither observations.

-For each dither observation, 3 photometric exposures are acquired in the 3 photometric bands by rotating the NI-FWA and 1 spectro exposure is acquired.

- In spectroscopy, a different combination of 2 spectral band and 2 dispersion directions is used for each of the 4 dither observations.

- A VIS exposure is acquired in parallel with each spectroscopy exposure to avoid any disturbances from NI-FWA and NI-GWA actuations.

- The VIS shutter is kept closed during photometry.



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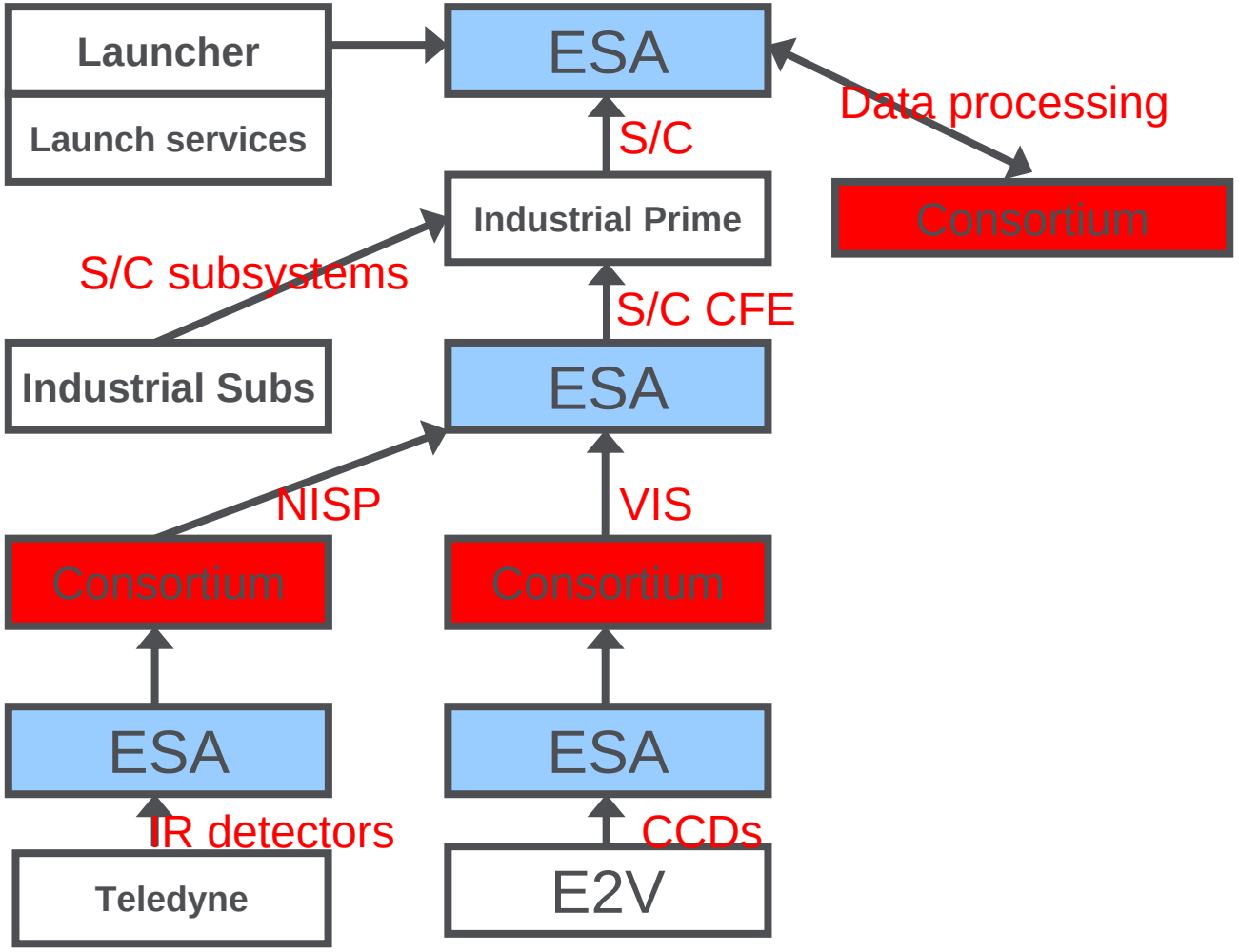
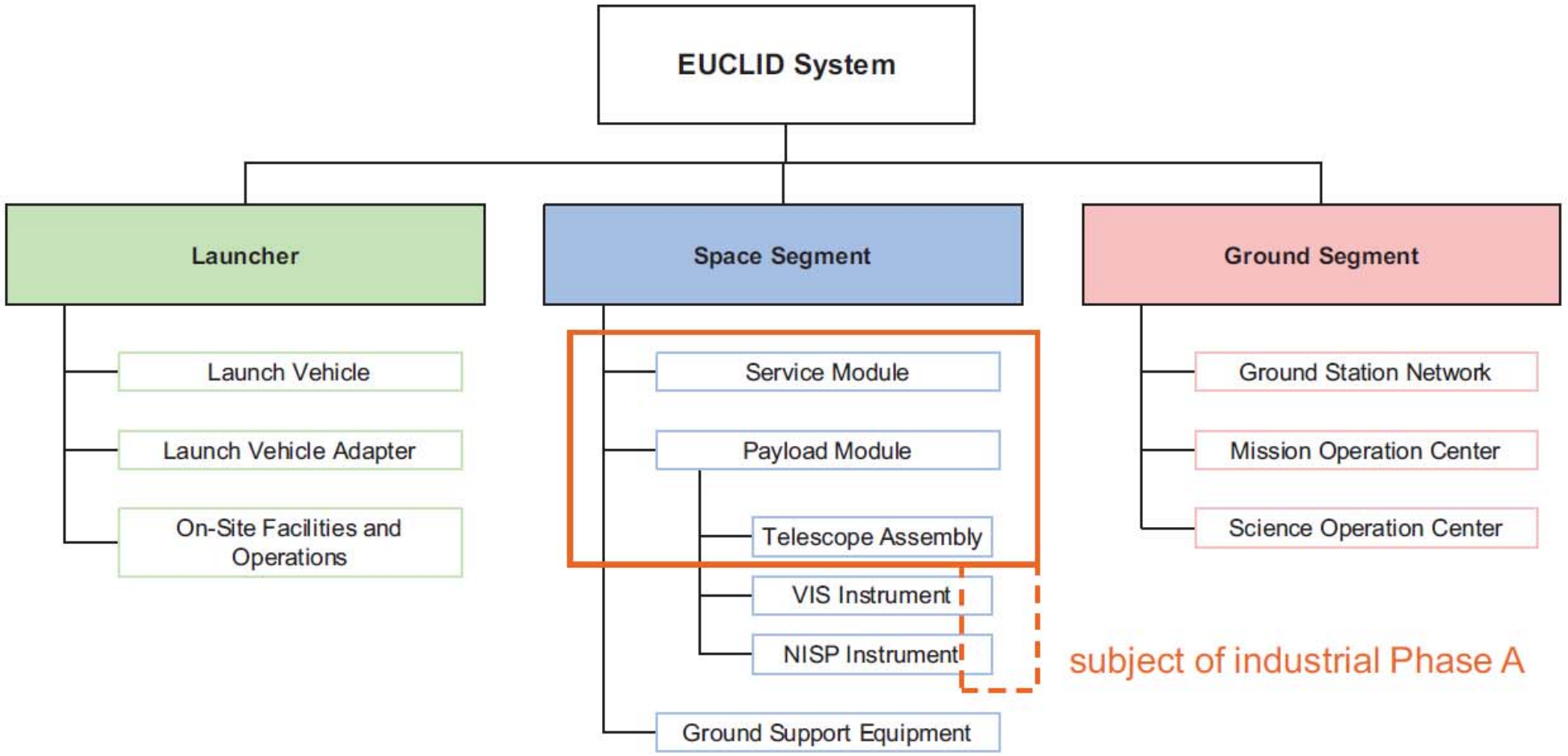
EUCLID Organization



EUCLID Definition Studies



Industrial Definition Studies

Phase A1: Optimization of EUCLID mission

- System Requirements and Functional Specification
- Space Segment Concept
- Analysis of optimized mission concept

→ Mission Definition Review (held on November 2010)

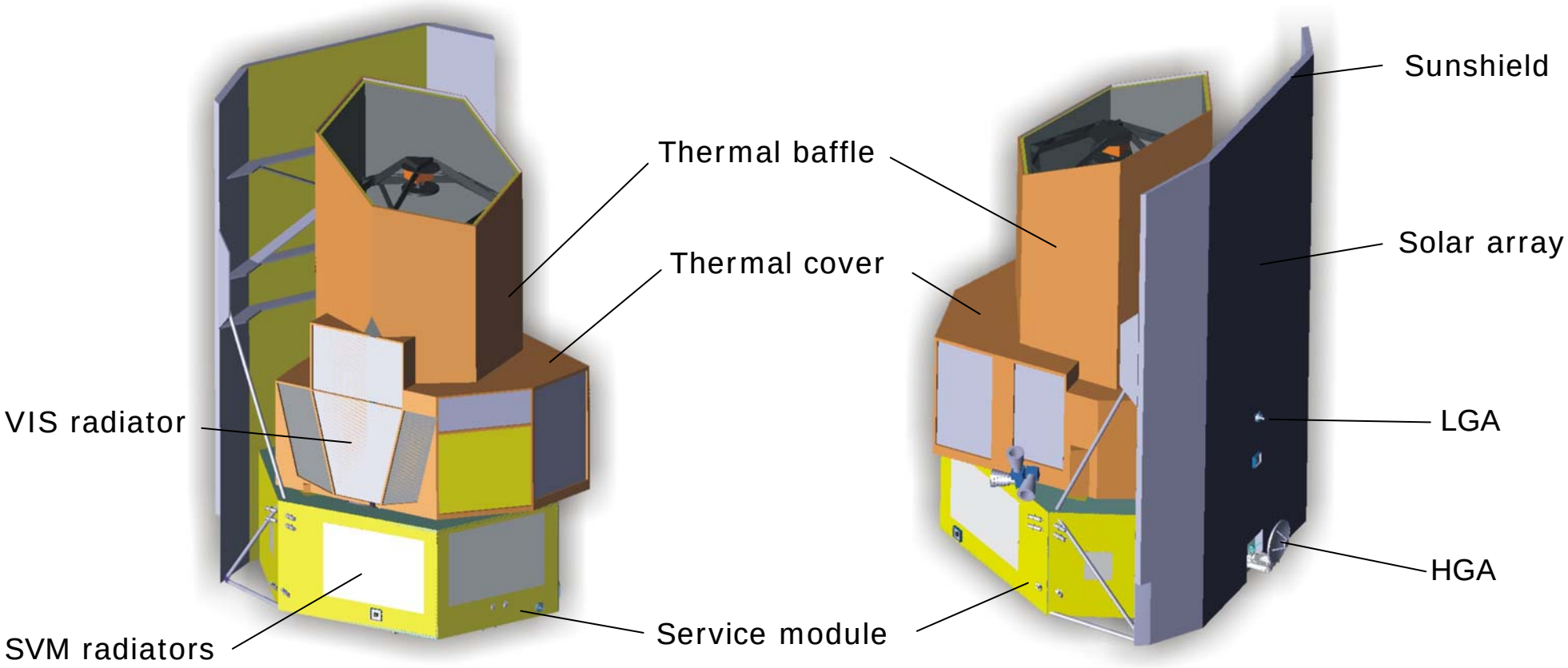
Phase A2: Consolidation of EUCLID Space Segment Design

- Payload Module Design
- Spacecraft and Service Module Design
- Development and Verification Approach
- Programmatic and Cost

→ Preliminary Requirement Review (held on June 2011)

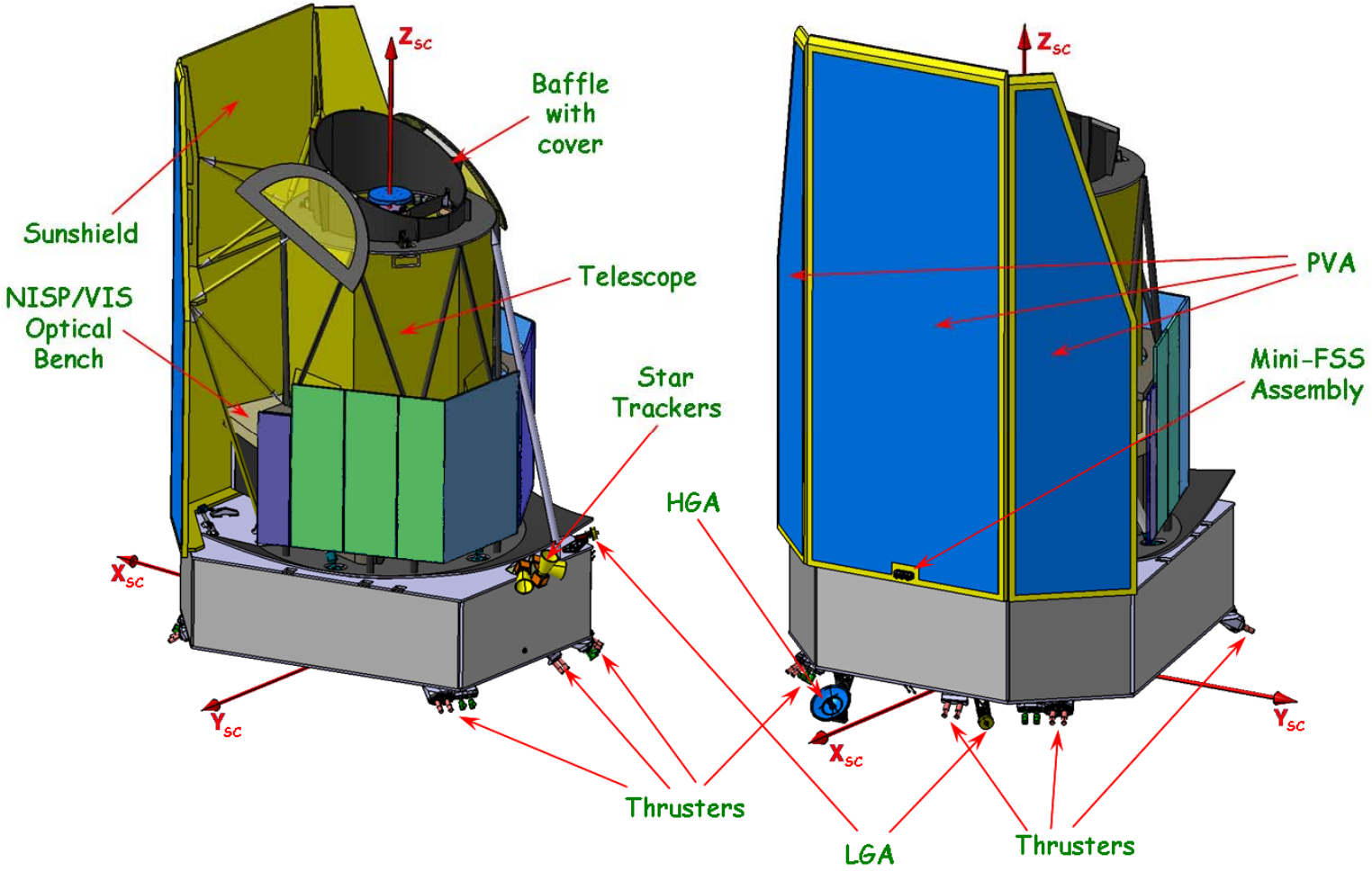
EUCLID spacecraft preliminary design

Astrium concept



EUCLID spacecraft preliminary design

TAS concept



EUCLID spacecraft preliminary designs

ASTRIUM concept

Telescope

- Primary Mirror: SiC
- Cold Telescope (T~150K)
- Passive Thermal Control

AOCS

- Fine pointing: Cold Gas + FGS & Gyro
- Slews: Cold Gas + Star Tracker & Gyro

THALES concept

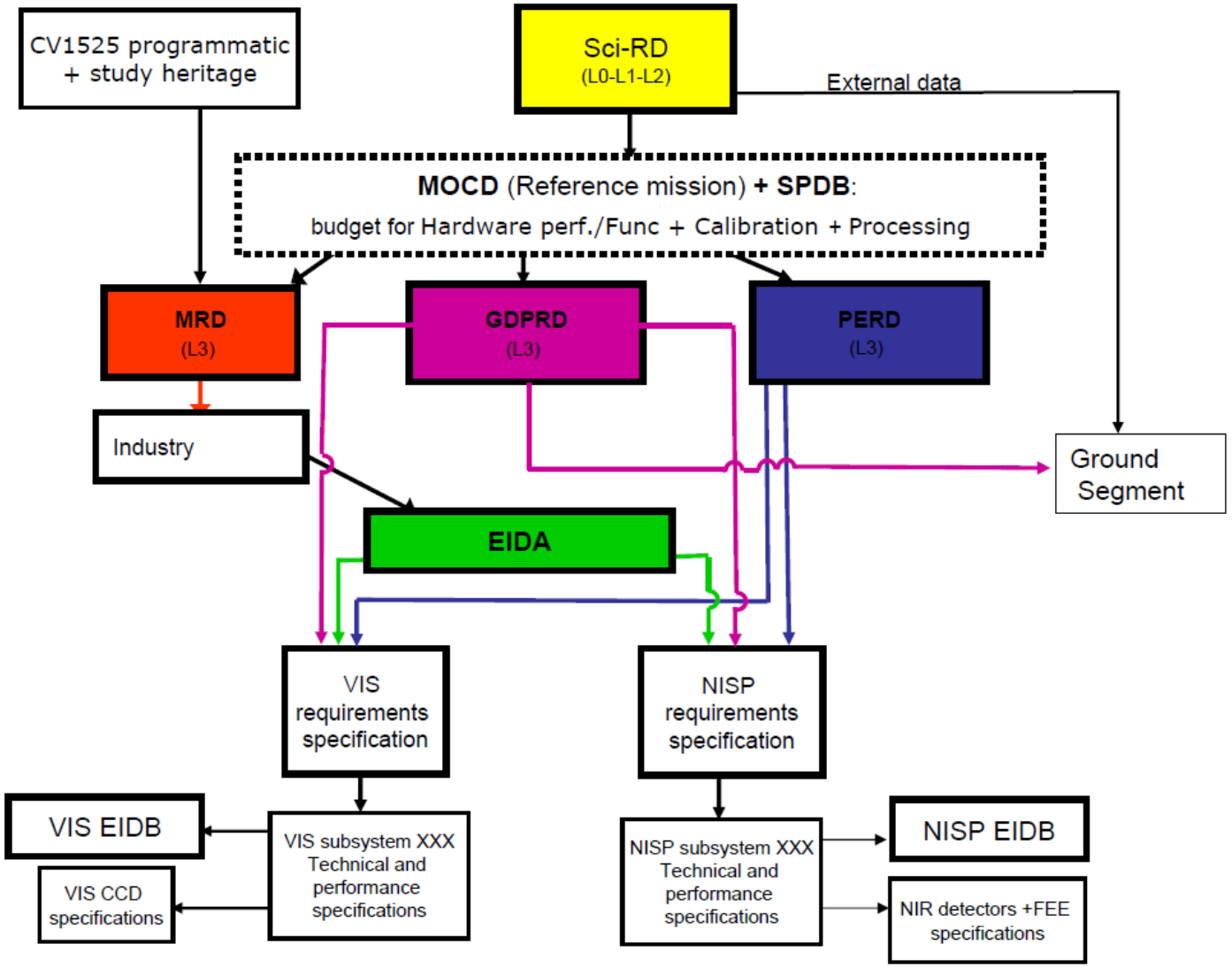
Telescope

- Primary Mirror: Zerodur
- Cold Telescope (T~240K)
- Active Thermal Control

AOCS

- Fine pointing: Cold Gas + FGS & Gyro
- Slews: Reaction Wheel + Star Tracker & Gyro

Requirements Document Tree



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Preliminary Requirement Review (PRR)

A Euclid Preliminary Requirement Review (PRR) was held in June 2011 with the aim to confirm:

- The adequacy and completeness of the science requirements and breakdown to space segment requirements.
- The technical feasibility of the space segment,
- The verification program feasibility of the space segment.

Euclid PRR recommendations

- The Euclid Preliminary Requirements Review Board acknowledged the significant progress achieved by Industry and the Euclid Consortium in the definition of the Euclid space segment.

- The Board considered that the current definition of the space segment hardware does not feature fundamental feasibility or technology readiness issues.

- However, the definition has not yet stabilised and requires further consolidation work.

→ The Board therefore recommended to the study team to extend the Phase A work and achieving a stable and consolidated definition.

Phase A finalization

ESA, the Euclid Consortium, and Industry are now implementing the PRR board recommendations, i.e:

- On requirements baseline,
  - Finalise and approve the current evolution of the Science Requirements Document,
  - Flow down the L2 requirements formulation at spacecraft, instrument and data processing level,
  - Consolidate the Euclid performance budget and the reference mission operation concept.

- On spacecraft design,
  - Consolidate and optimize with respect to mass the spacecraft and instruments design,
  - Consolidate the interfaces between the spacecraft and the instruments,
  - Quantify the achievable performance of the space segment concepts

- On lower level specifications
  - Finalise the spacecraft requirements (MRD)
  - Finalise the payload element requirements (PERD)
  - Establish the ground based data processing requirements (GDPR)

- On performance
  - Verify the end to end performance of the Euclid mission.

Euclid next steps

- An Instrument Design Consolidation Review (IDCR) will be held at ESTEC mid-November.
- The ESA study team will releases a Phase A close out report to the PRR Board at the end of November 2011 based on IDCR output and Industry Phase A extension output.
- If Euclid is selected, industrial studies will continue to Phase B1, concentrating on the spacecraft development preparation (preparation of the sub-system bid packages).
- The Euclid Consortium will verify the end to end science performance of the mission by January 2012.
- If ESA Science Programme Committee adopts the Euclid mission in February 2012, ESA will release the invitation to tender for Phase B2/CD in Spring 2012.

→ The industrial implementation phase of Euclid could start in September 2012 for a launch in 2019.

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Summary

- The Euclid Preliminary Requirements Review Board acknowledged the significant progress by the Euclid Consortium in the definition of the Euclid VIS and NISP instruments.

- The ASTRIUM and TAS industrial teams have each identified a Euclid space segment concept that does not feature fundamental feasibility or technology readiness issues.

- ESA, Industry and the Euclid Consortium study teams are now consolidating the definition of the Euclid space segment. A Phase A close out report will be issued at the end of November 2011.

- If SPC selects and then adopts the Euclid mission in February 2012, ESA will release the ITT for Phase B2/CD in Spring 2012 and the industrial implementation phase will start in September 2012.

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