1. Mission overview

2. Industrial Definition Studies

3. Euclid study status

4. Summary
• Launcher: Soyuz ST2-1B from Kourou

• Direct injection into transfer 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
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

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

113 kg mass allocation; 252 W max power allocation
**VIS Instrument**

**VI-FPA**
- 36 CCD’s (153 K)

**VI-RSU**
- One leaf shutter

**VI-PMCU**
(Power Mgt & Control Unit)

**VI-Cal. Unit**

**VI-CDPU**
(Command & Data Processing Unit)
128.7 kg mass allocation
178 W max allocated power
NISP Instrument

NI-OHA

CoLA (Corrector Lens Assembly)

NI-GWA + NI-FWA

NI-FPA (16 detectors)
• 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.)
- 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

- Launcher
  - Launch services
- Industrial Subs
  - S/C subsystems
- Consortium
  - NISP
  - VIS
  - IR detectors
  - Teledyne
  - E2V
  - CCDs

ESA

Industrial Prime

Consortium

Data processing

ESA

S/C

S/C CFE
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)
Astrium concept

- Thermal baffle
- Thermal cover
- Sunshield
- Solar array
- LGA
- HGA
- VIS radiator
- SVM radiators
- Service module
EUCLID spacecraft preliminary design

TAS concept

- Sunshield
- NISP/VIS Optical Bench
- Telescope
- Baffle with cover
- Star Trackers
- HGA
- PVA
- Mini-FSS Assembly
- LGA
- Thrusters
- X_{sc}
- Y_{sc}
- Z_{sc}
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
1. Mission overview

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4. Summary
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.
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.
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.