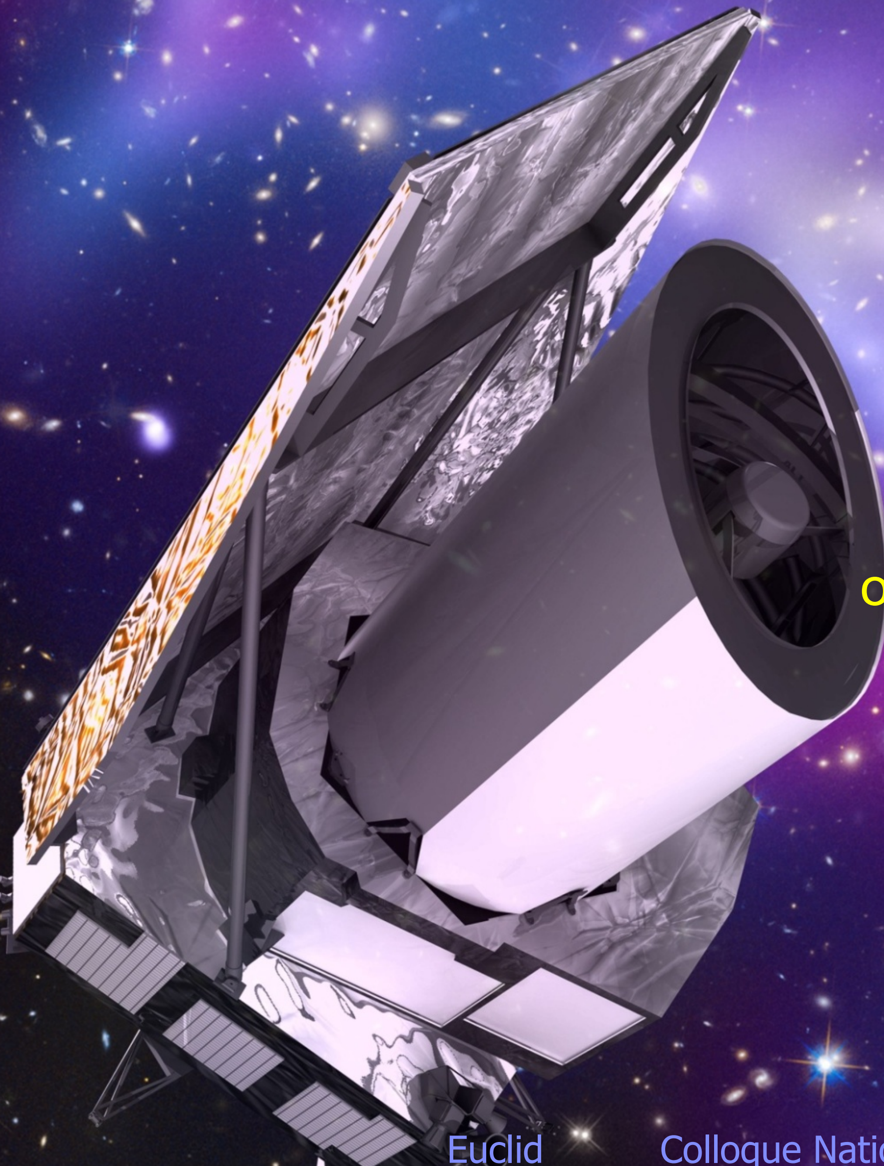


Euclid

Y. Mellier
on behalf of the Euclid Consortium

www.euclid-ec.org

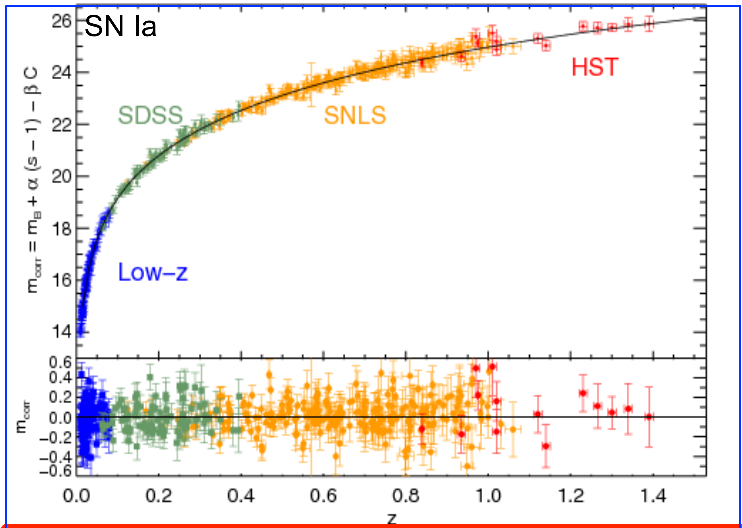
Euclid:
Overview and current status

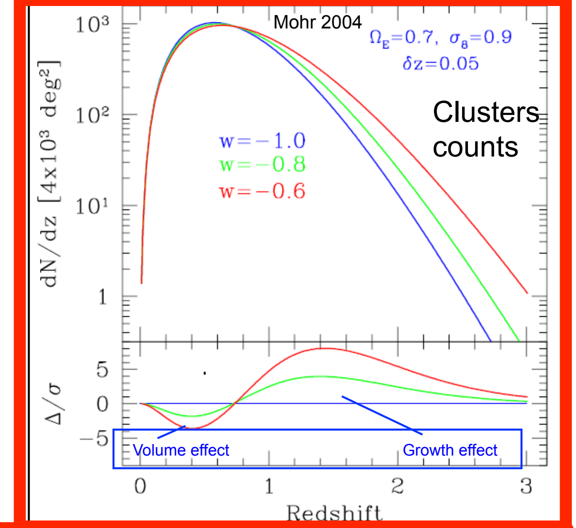
Euclid Top Level Science Requirements

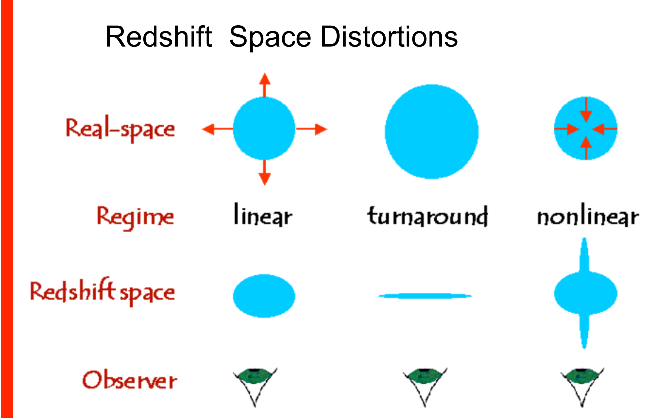
Sector	Euclid Targets
Dark Energy	• Measure the cosmic expansion history to better than 10% in redshift bins $0.7 < z < 2$. • Look for deviations from $w = -1$, indicating a dynamical Dark energy. • Euclid *alone* to give $FoM_{DE} \geq 400$ (1-sigma errors on w_p, & w_a of 0.02 and 0.1 respectively)
Test Gravity	• Measure the growth index, γ, with a precision better than 0.02 • Measure the growth rate to better than 0.05 in redshift bins between $0.5 < z < 2$. • Separately constrain the two relativistic potentials. ψ and ϕ • Test the cosmological principle
Dark Matter	• Detect Dark matter halos on a mass scale between 10^8 and $>10^{15}$ M_{Sun} • Measure the Dark matter mass profiles on cluster and galactic scales • Measure the sum of neutrino masses, the number of neutrino species and the neutrino hierarchy with an accuracy of a few hundredths of an eV
Initial Conditions	• Measure the matter power spectrum on a large range of scales in order to extract values for the parameters σ_8 and n to a 1-sigma accuracy of 0.01. • For extended models, improve constraints on n and α wrt to Planck alone by a factor 2. • Measure a non-Gaussianity parameter : f_{NL} for local-type models with an error < +/-2.

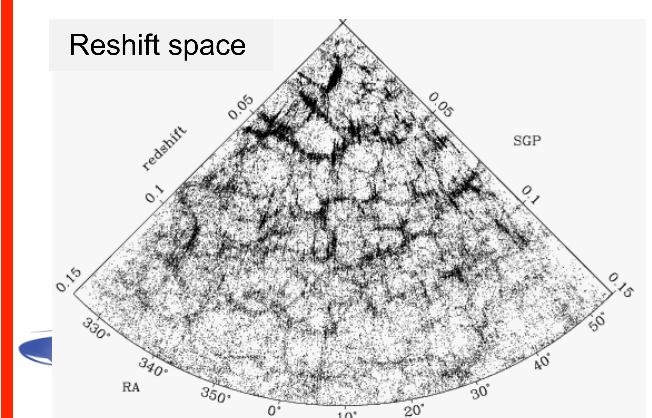
- DE equation of state: $P/\rho = w$, and $w(a) = w_p + w_a(a_p - a)$
- Growth rate of structure formation: $f \sim \Omega^{\gamma}$;
- FoM=$1/(\Delta w_a \times \Delta w_p) > 400 \rightarrow \sim 1\%$ precision on w's.

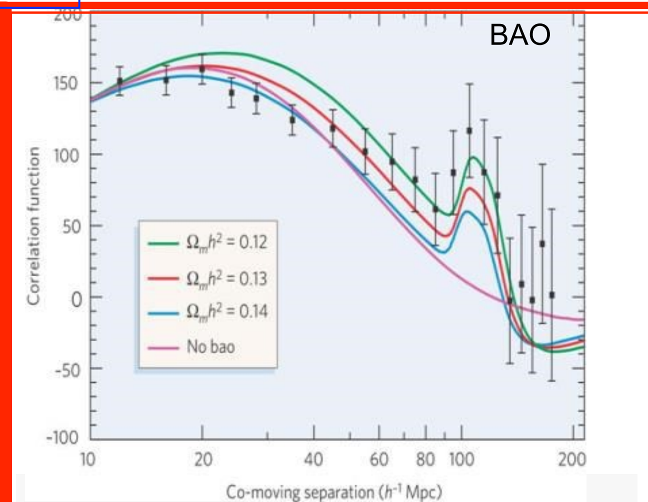
Euclid probes of Dark Energy

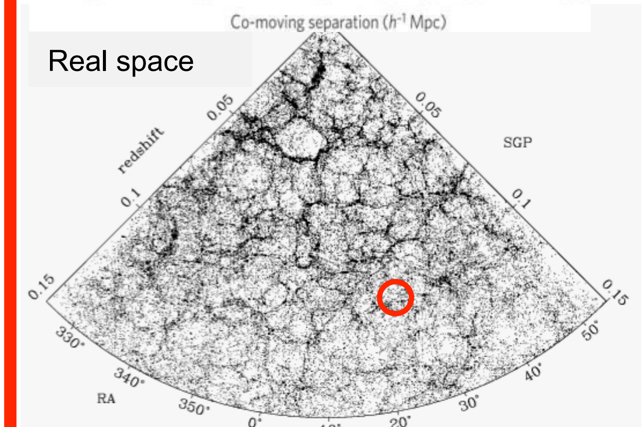


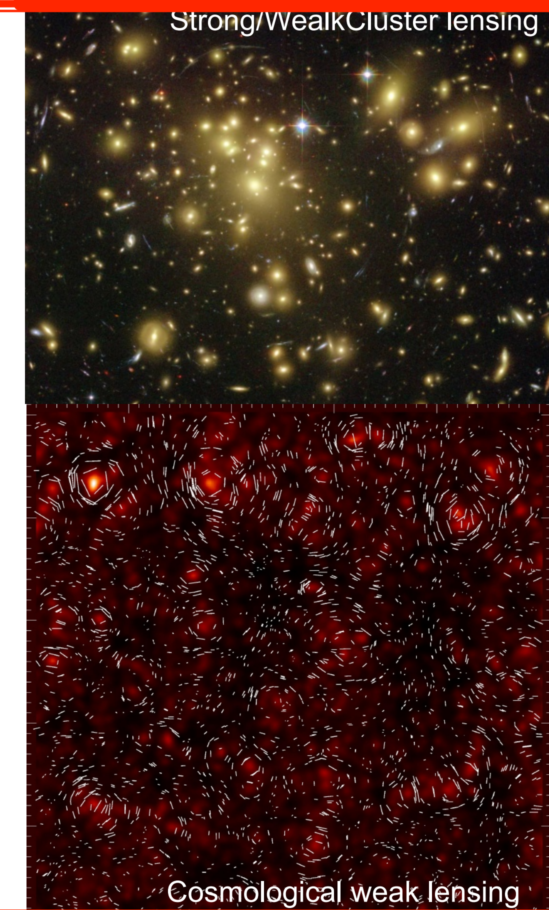


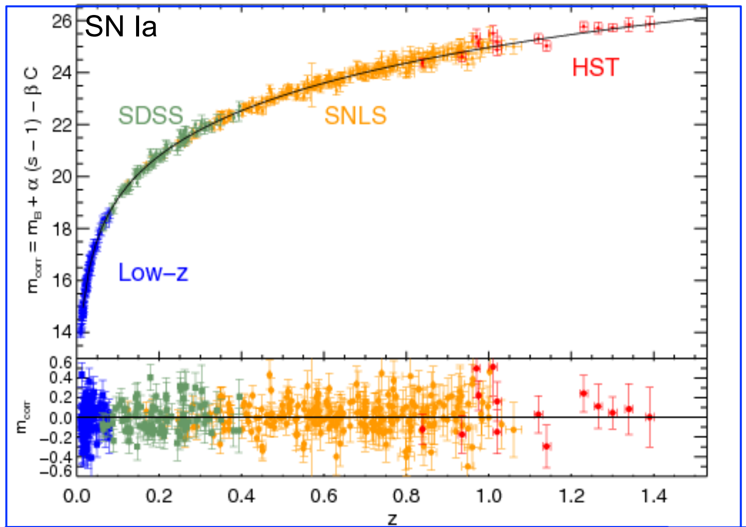




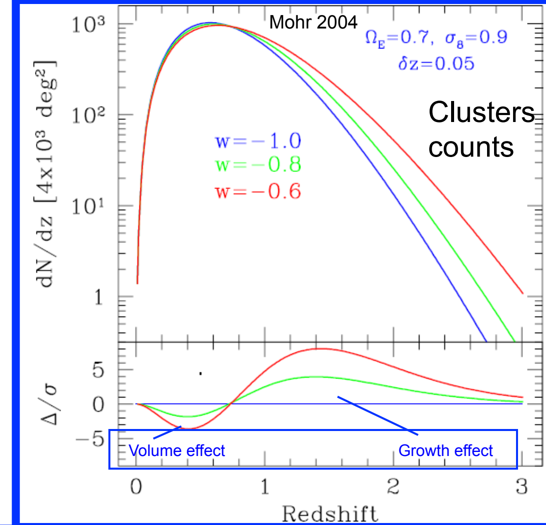


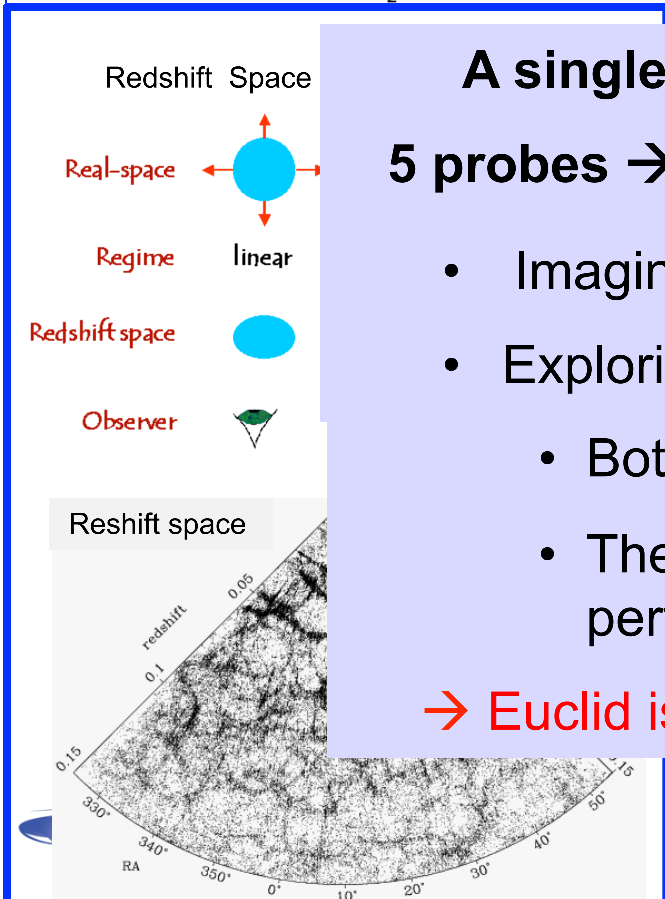


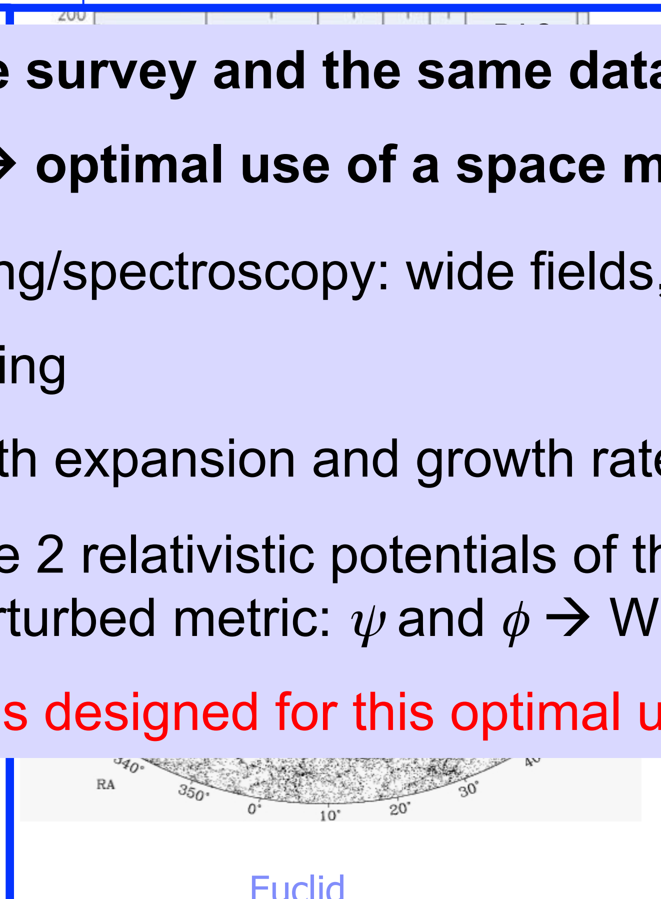


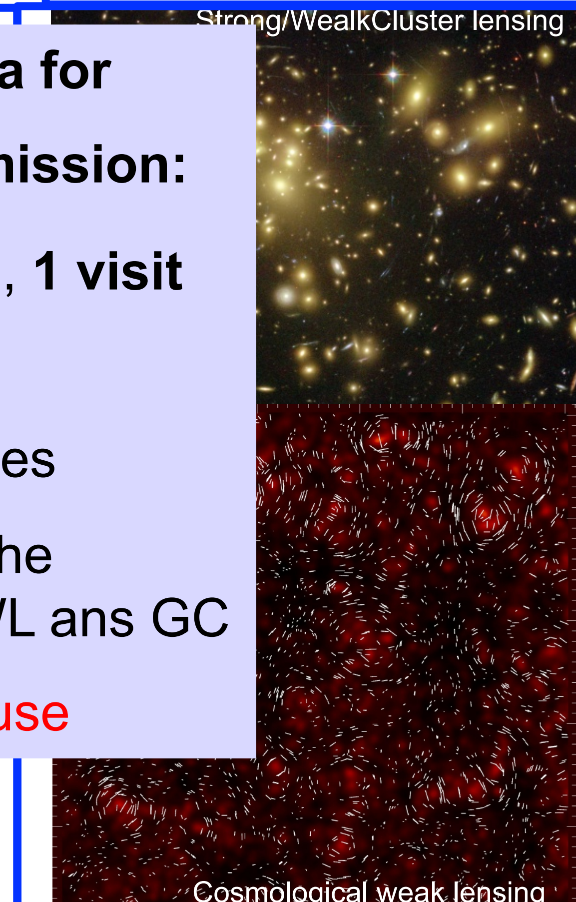


Euclid probes of Dark Energy









A single survey and the same data for

5 probes → optimal use of a space mission:

- Imaging/spectroscopy: wide fields, **1 visit**
- Exploring
  - Both expansion and growth rates
  - The 2 relativistic potentials of the perturbed metric: ψ and ϕ → WL ans GC

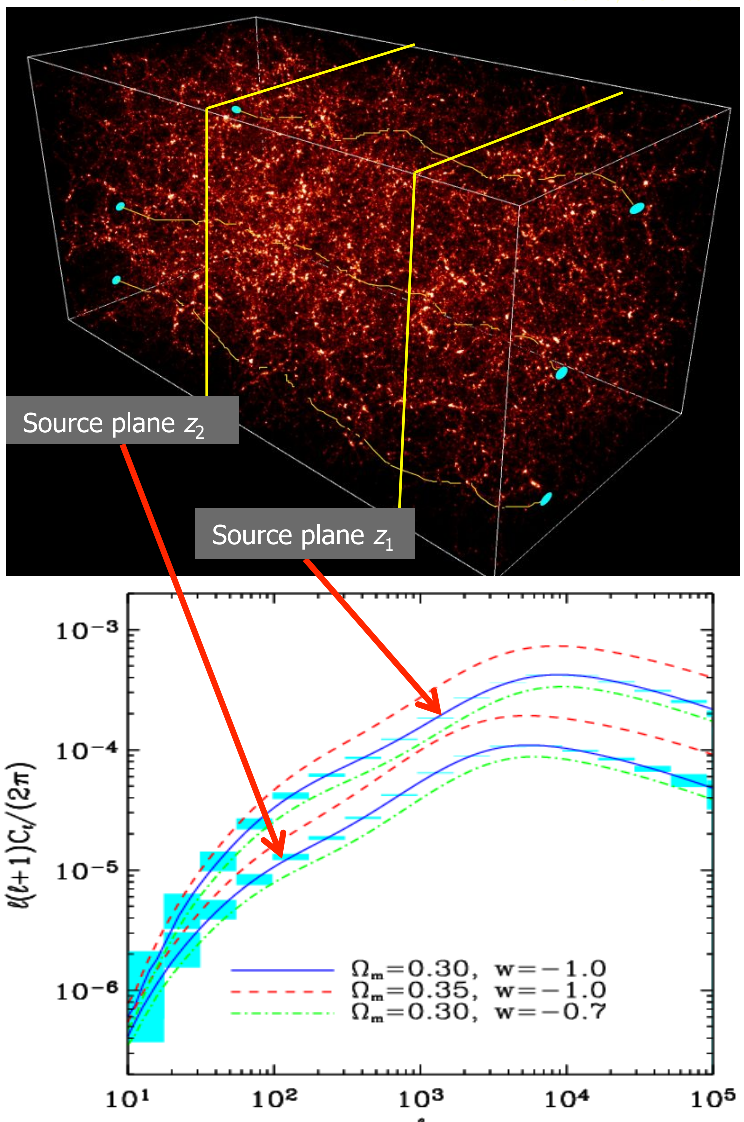
→ Euclid is designed for this optimal use

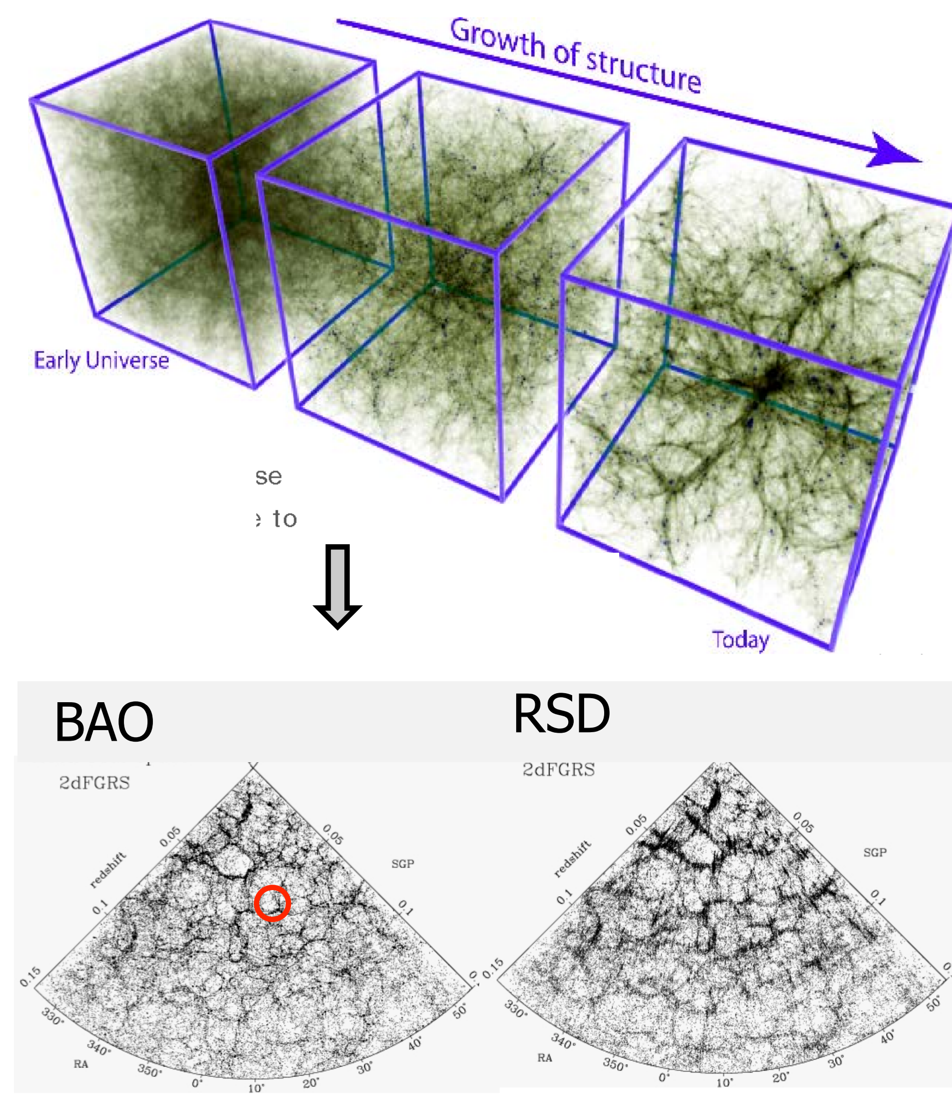
WL probe: Cosmic shear over 0<z<2 :

1.5 billion galaxies shapes, shear and phot-z (u,g,r,i,z, Y,J,H) with 0.05 (1+z) accuracy over 15,000 deg^2

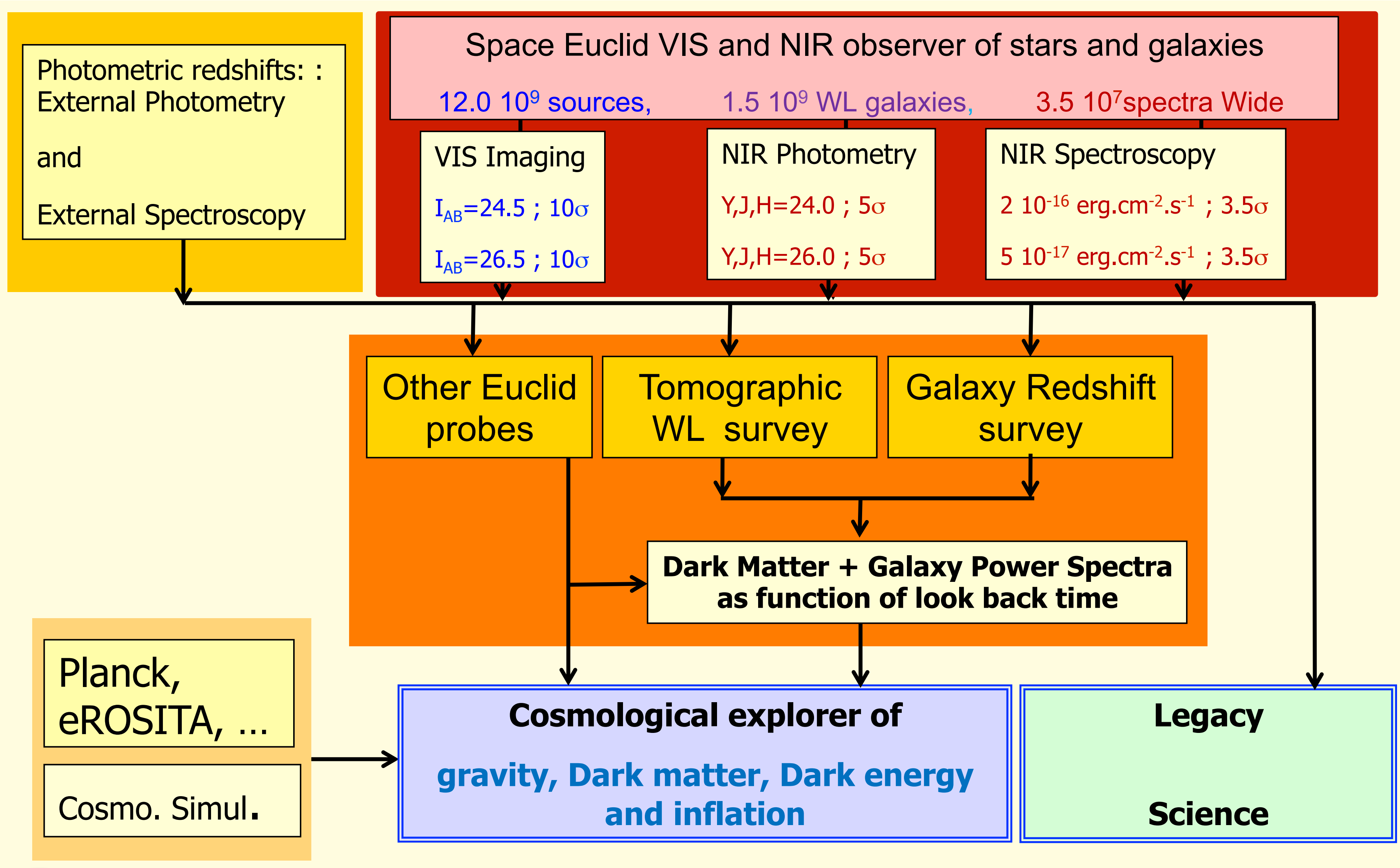
GC; BAO, RSD probes: 3-D positions of galaxies over 0.7<z<1.8 :

35 million spectroscopic redshifts with 0.001 (1+z) accuracy over 15,000 deg^2





Euclid Survey Machine:15,000 deg^2 + 40 deg^2

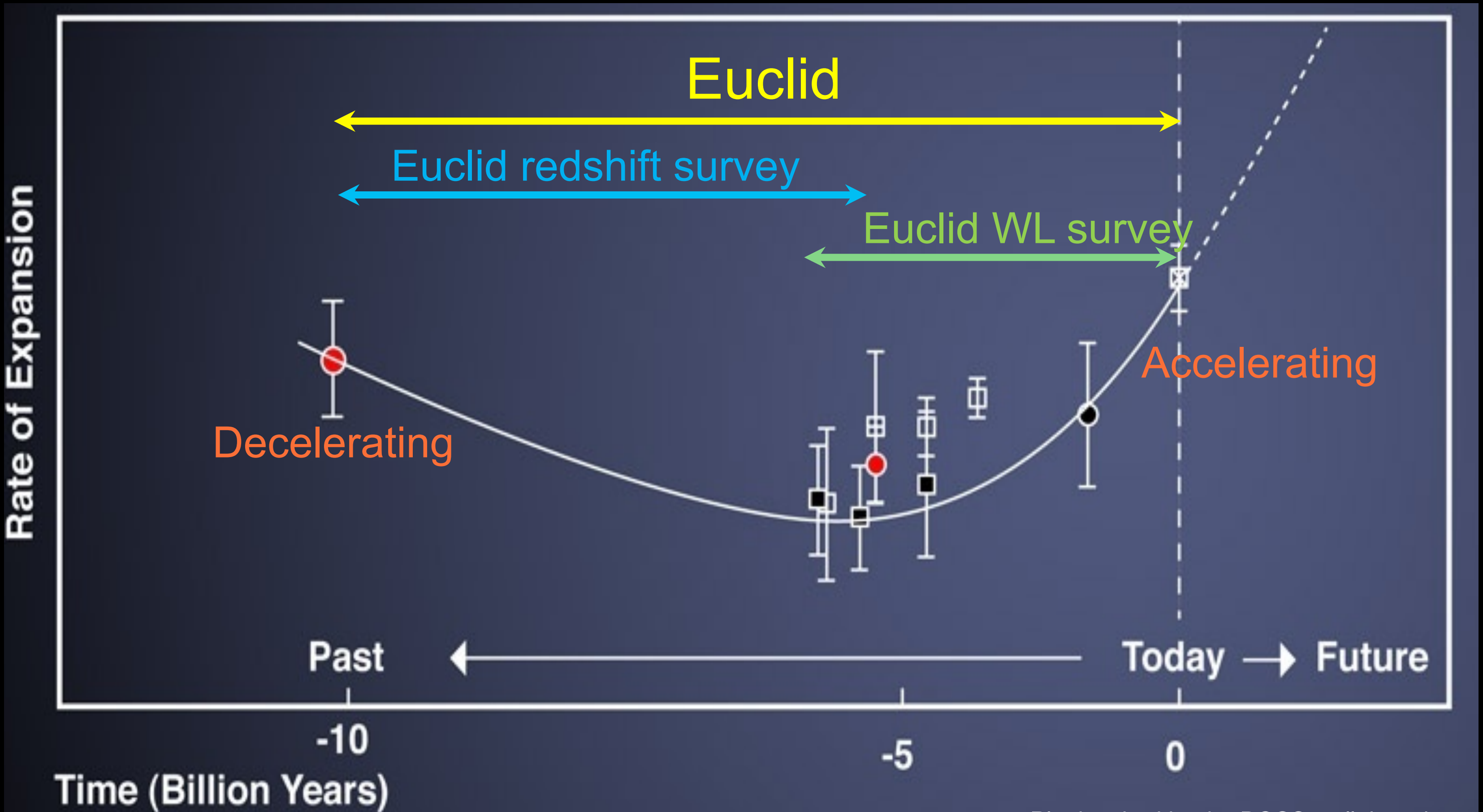


Euclid Wide+Deep Surveys

- **Euclid Wide:**
  - 15000 deg^2 outside the galactic and ecliptic planes
  - 12 billion sources (3-σ)
  - 1.5 billion galaxies (30 gal/$arcmin^2$) with
    - Very accurate morphometric information (WL)
    - Visible photometry: (u), g, r, i, z , (R +I+Z) AB=24.5, 10.0 σ +
    - NIR photom: Y, J, H AB = 24.0, 5.0σ
    - Photo-z with 0.05(1+z) accuracy
  - 35 million spectroscopic redshifts of emission line galaxies with
    - R: 260
    - 0.001 z accuracy
    - 21 mag
    - Hα galaxies within 0.7 < z < 1.85
    - Flux line: 2 . 10^{-16} erg.cm^{-2}.s^{-1} ; 3.5σ

- **Euclid Deep:**
  - 1x10 deg^2 North Ecliptic pole (EDF-N) + 1x20 deg^2 South Ecliptic pole (EDF-S1 + 1x10 deg^2 at CDFS (EDF-S2)
  - 10 million sources (3-σ)
  - 1.5 million galaxies with
    - Very accurate morphometric information (WL)
    - Visible photometry: (u), g, r, i, z , (R +I+Z) AB=26.5, 10.0 σ +
    - NIR photom: Y, J, H AB = 26.0, 5.0σ
    - Photo-z with 0.05(1+z) accuracy
  - 150 000 spectroscopic redshifts of emission line galaxies with
    - R: 260
    - 0.001 z accuracy
    - 23 mag
    - Hα galaxies within 0.7 < z < 1.85
    - Flux line: 5 . 10^{-17} erg.cm^{-2}.s^{-1} ; 3.5σ

Euclid: exploring the DM-dominated / DE-dominated transition period

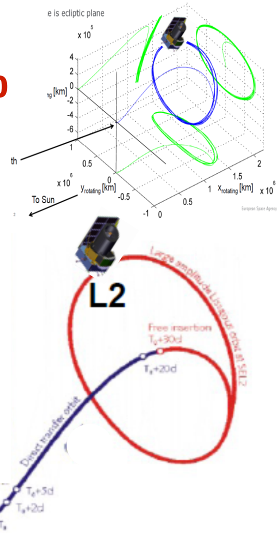


Plot inspired by the BOSS collaboration

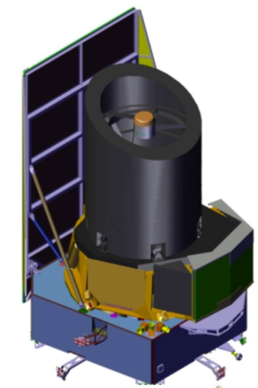
The ESA Euclid space mission

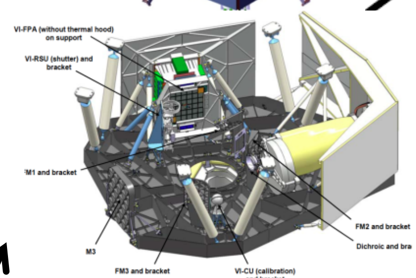
Soyuz@Kourou

Launch : Dec 2020

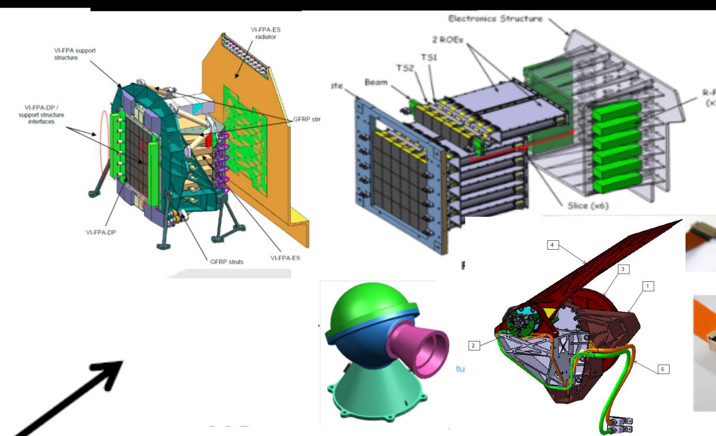


PLM+SVM

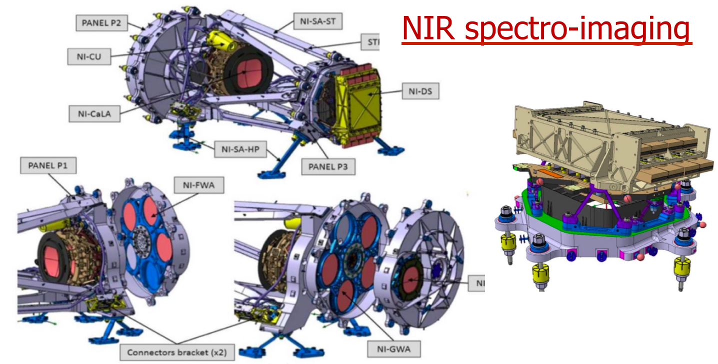




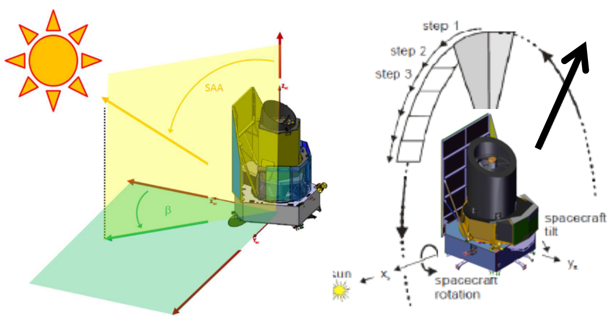
VIS imaging:

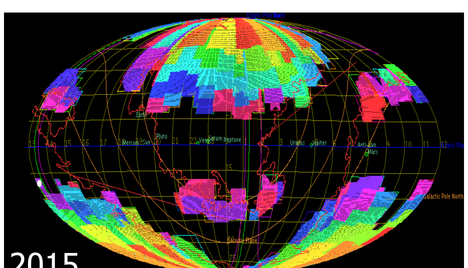


NIR spectro-imaging



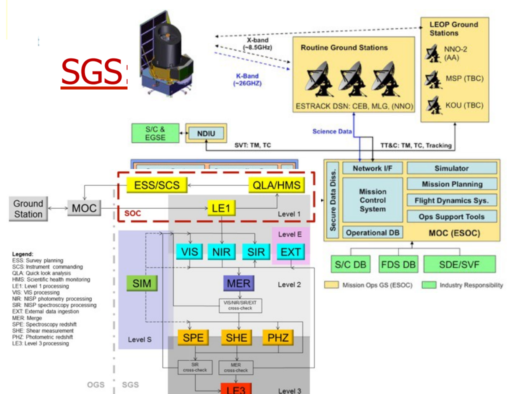
Surveys: 15,000 deg2, 6 yrs





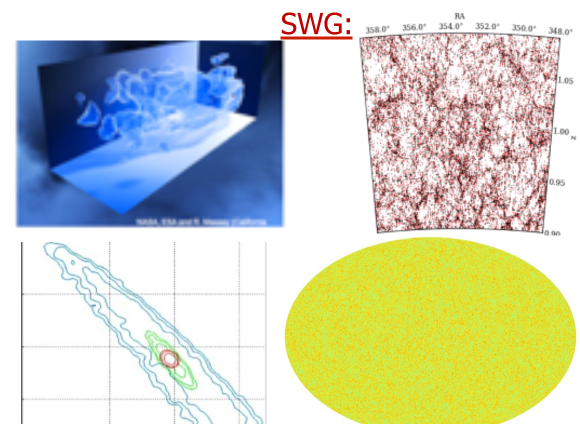
Ground data

SGS



~100 PB data processing

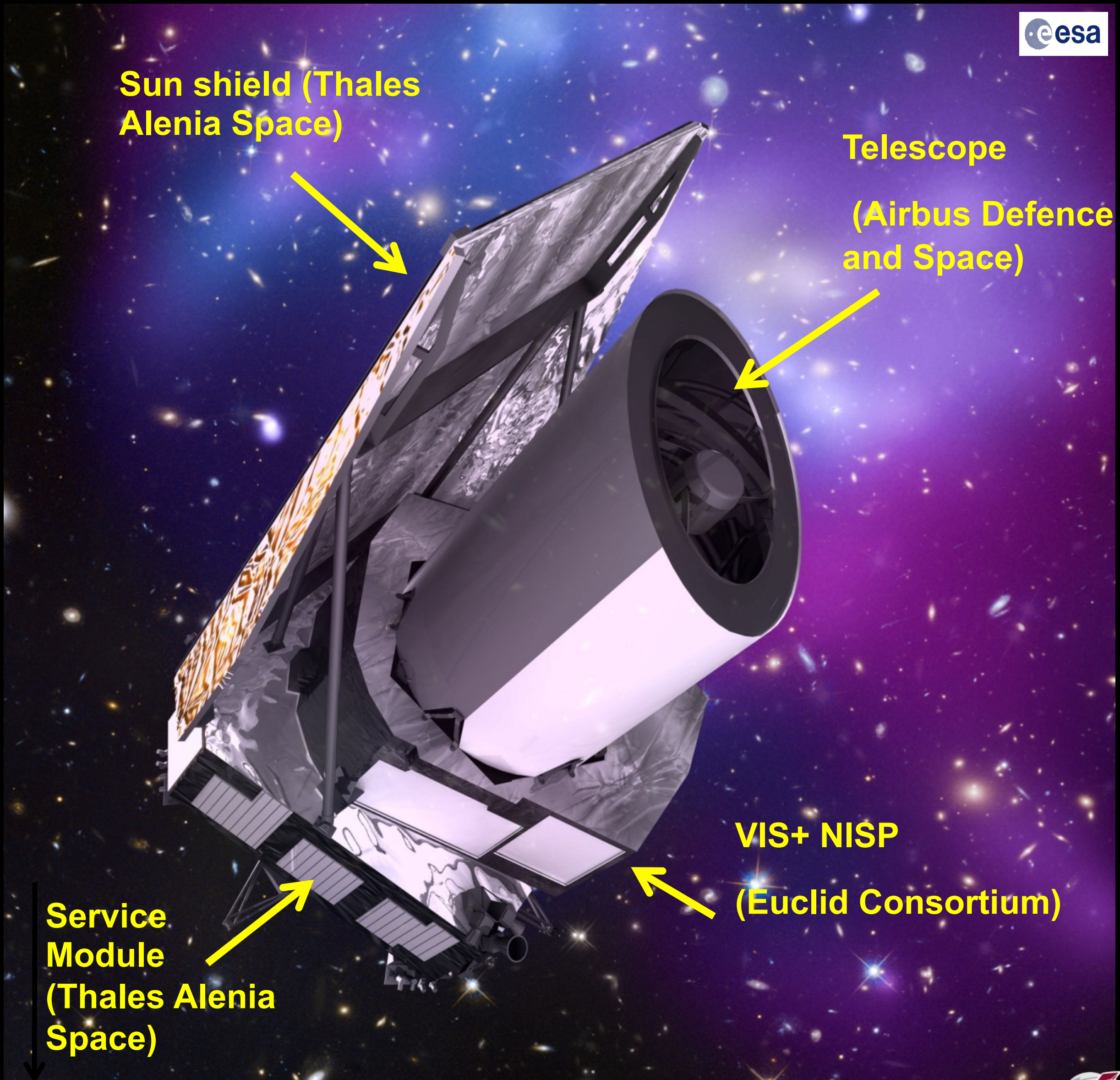
SWG:



Science analyses

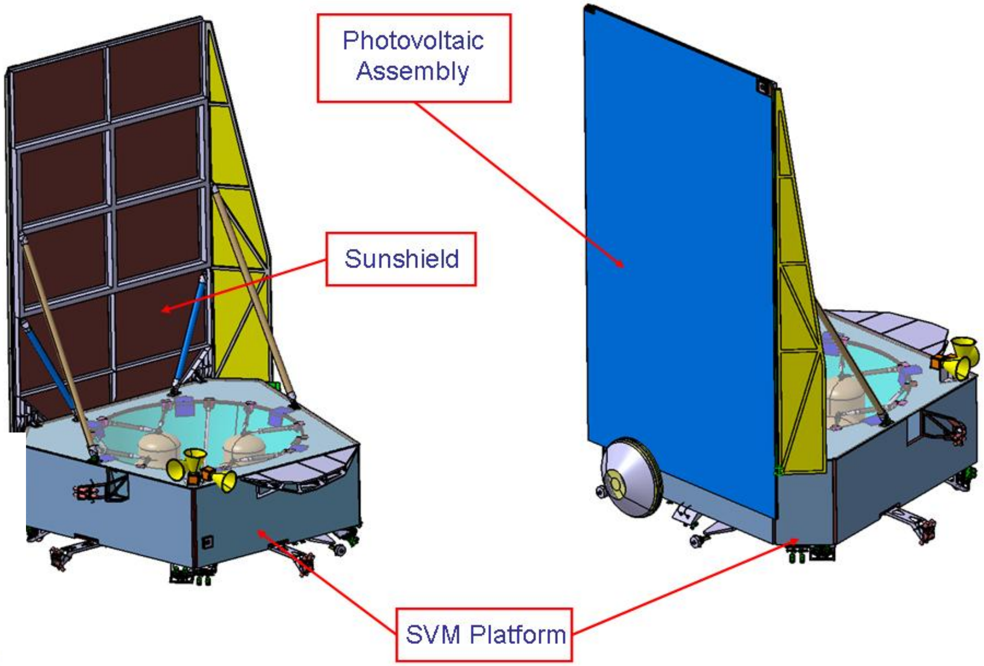
ESA Euclid mission:

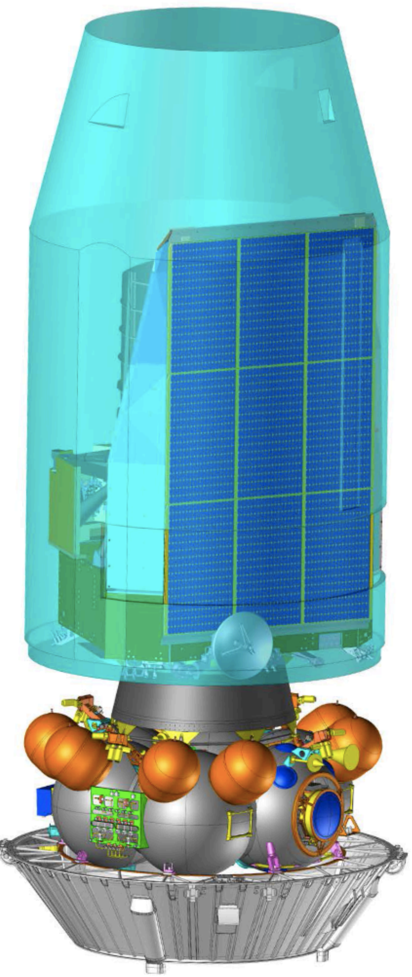
- - Total mass satellite :
- 2 200 kg
- - Dimensions:
- 4,5 m x 3 m
- - Launch: end 2020 by a Soyuz rocket from the Kourou space port
- Euclid placed in L2
- - Survey: 6 years,

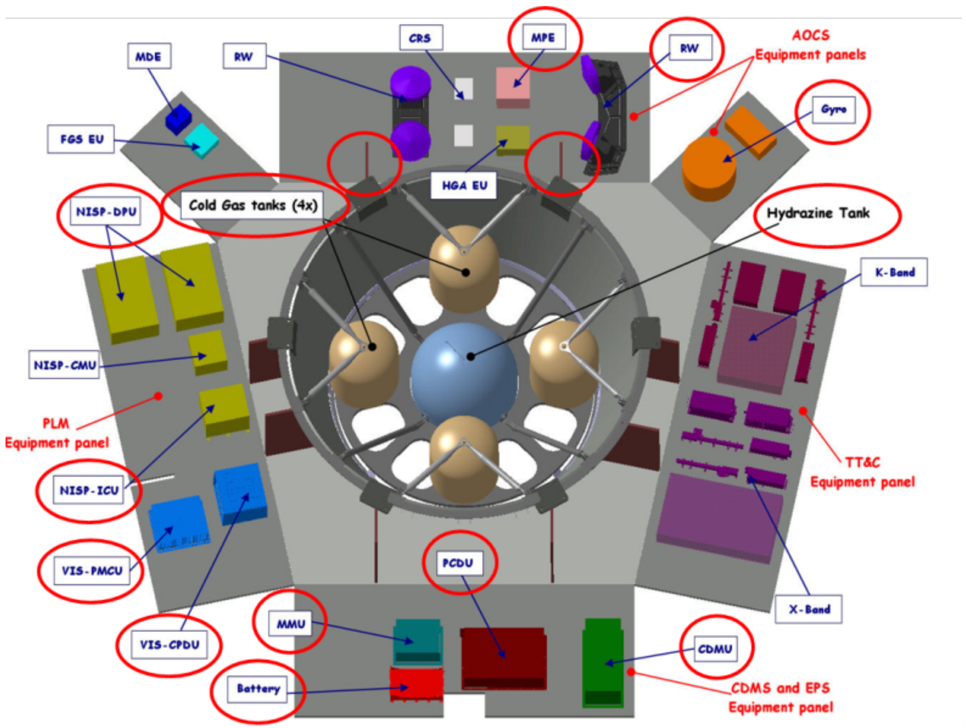


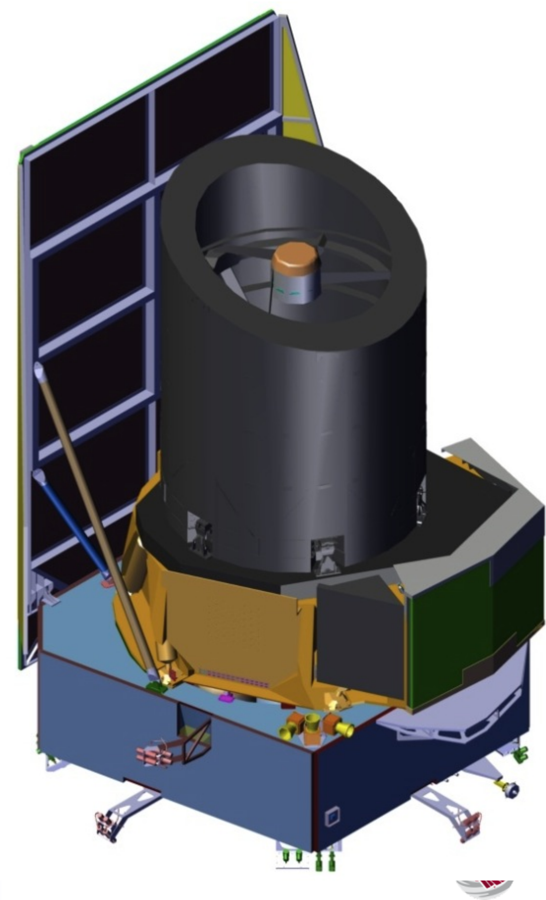
Euclid satellite elements

Spacecraft CDR in Dec 2017

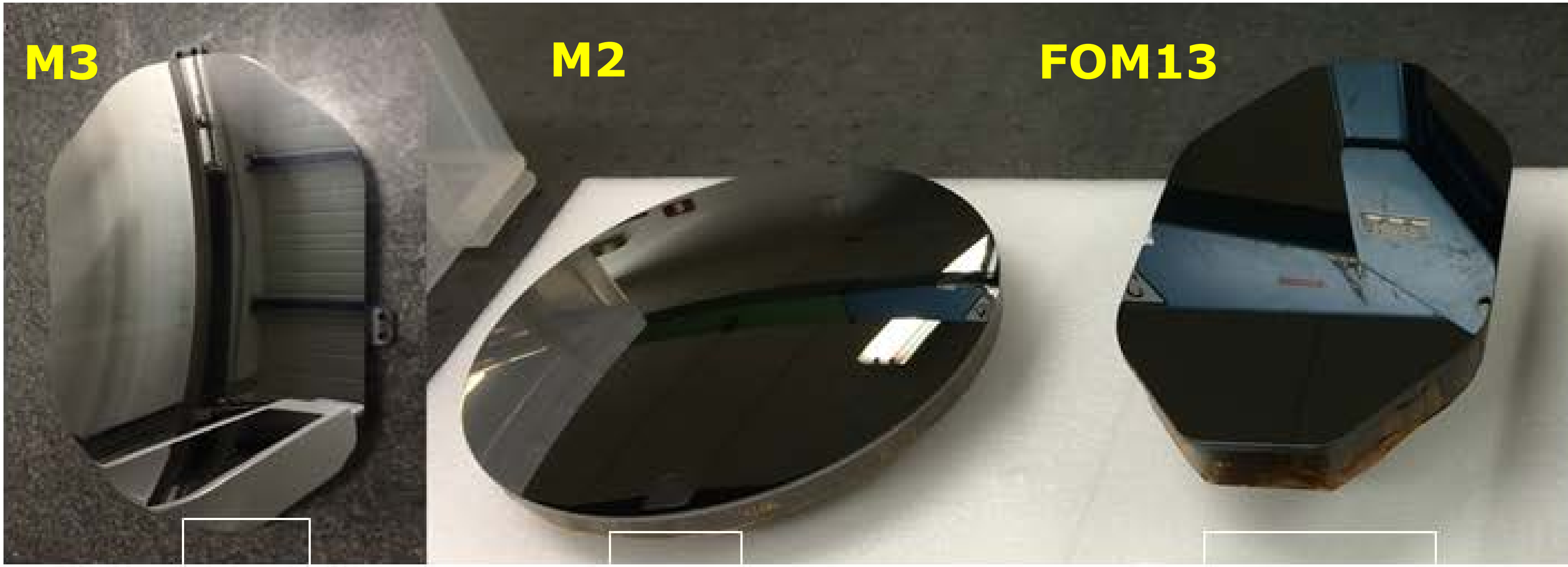








Euclid Spacecraft Flight Hardware



PLM, scientific instruments

From Thales Alenia Italy, Airbus DS, ESA Project office, Euclid Consortium

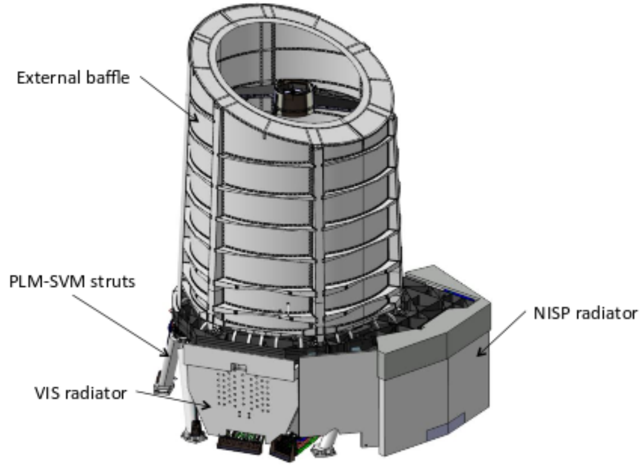
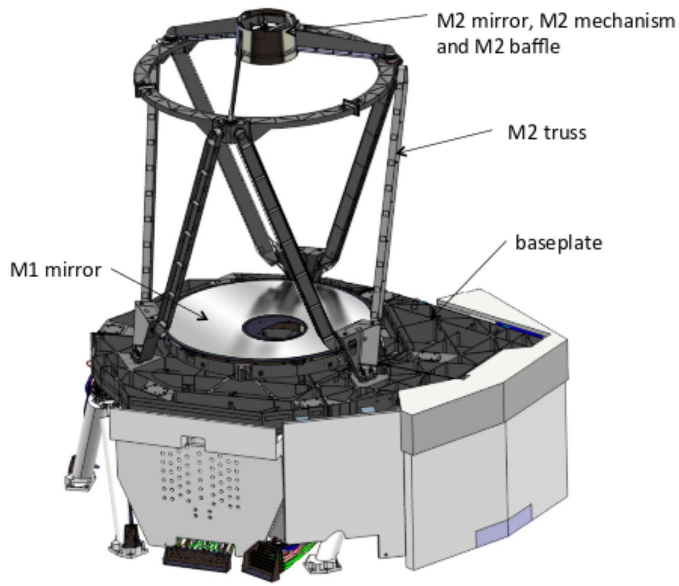
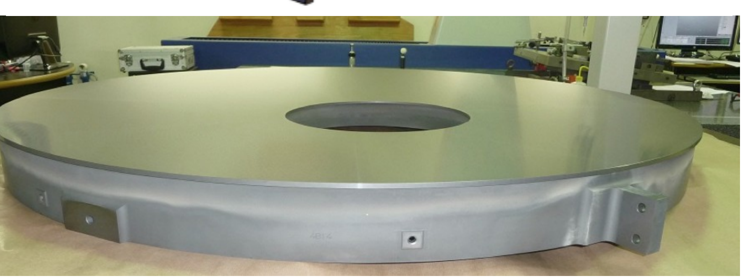
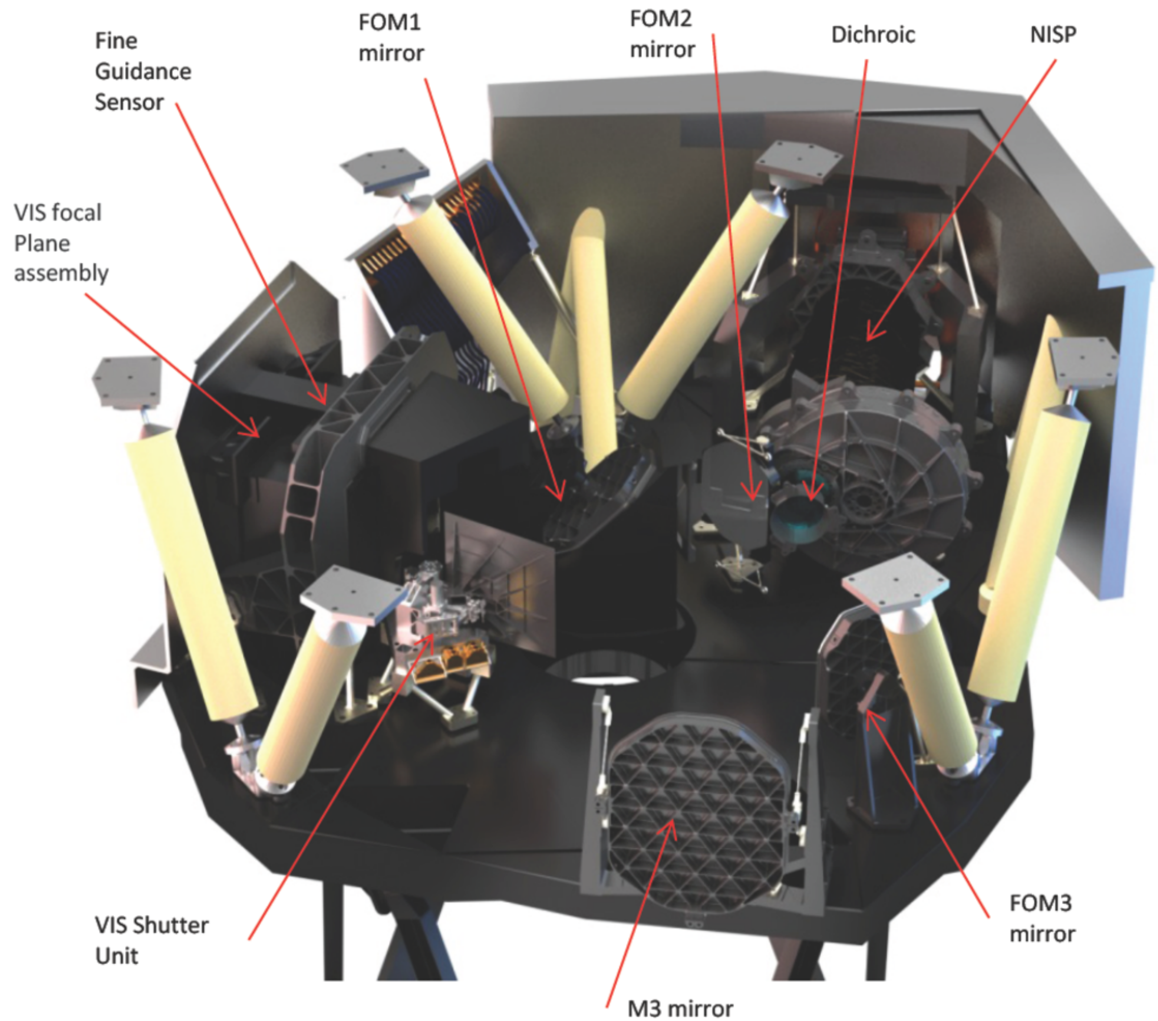


Figure 3-7 External front view of the PLM





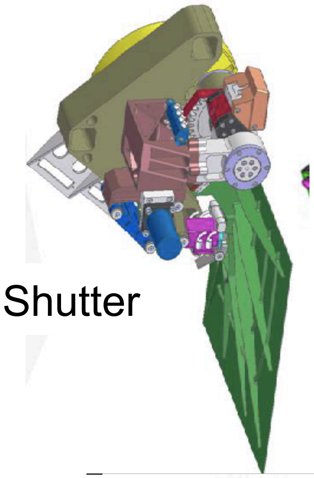


PLM CDR passed : close out Oct 2017

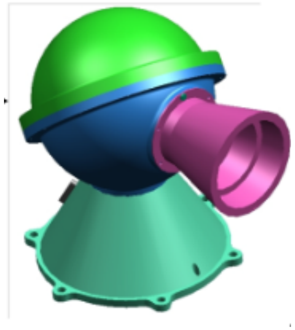
Courtesy: S. Pottinger, M. Cropper and the VIS team

VIS

VIS CDR on going: end Oct 2017



Shutter

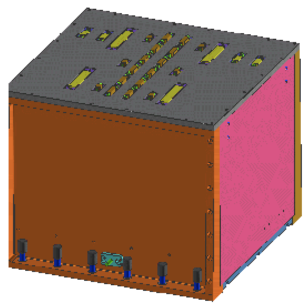


Calibration Unit

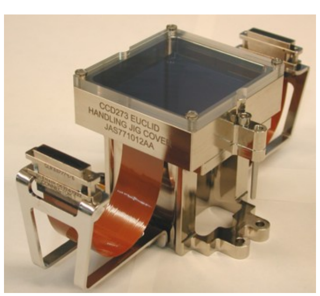
Cropper et al 2016:SPIE

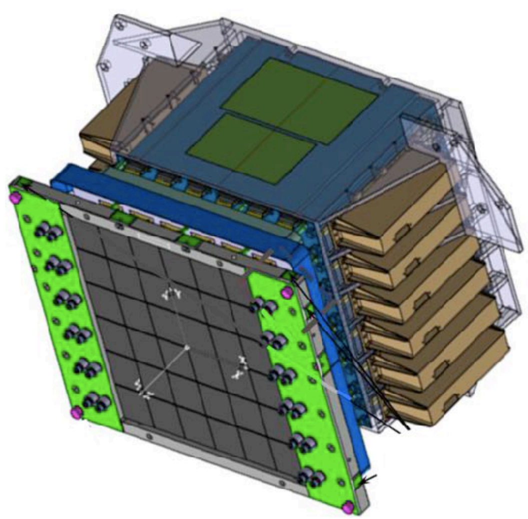
Spectral Band	550 – 900 nm
System Point Spread Function size	≤0.18 arcsec full width half maximum at 800 nm
System PSF ellipticity	≤15% using a quadrupole definition
Field of View	>0.5 deg^2
CCD pixel sampling	0.1 arcsec
Detector cosmetics including cosmic rays	≤3% of bad pixels per exposure
Linearity post calibration	≤0.01%
Distortion post calibration	≤0.005% on a scale of 4 arcmin
Sensitivity	$m_{AB} \geq 24.5$ at 10σ in 3 exposures for galaxy size 0.3 arcsec
Straylight	≤20% of the Zodiacal light background at Ecliptic Poles
Shear systematic bias allocation	additive $\sigma_{sys} \leq 2 \times 10^{-4}$; multiplicative $\leq 2 \times 10^{-3}$

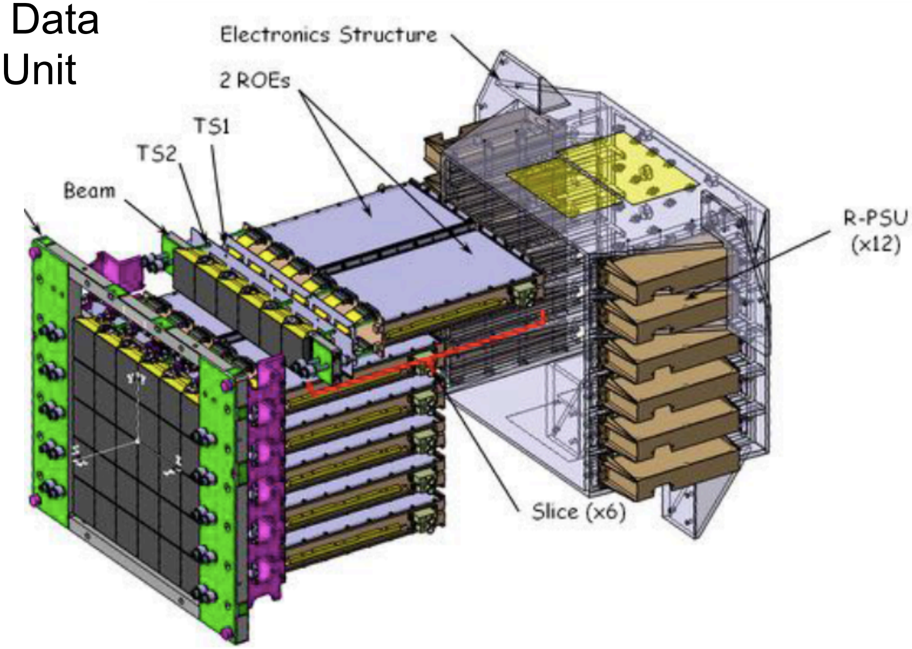
Power and Mechanism Control Unit

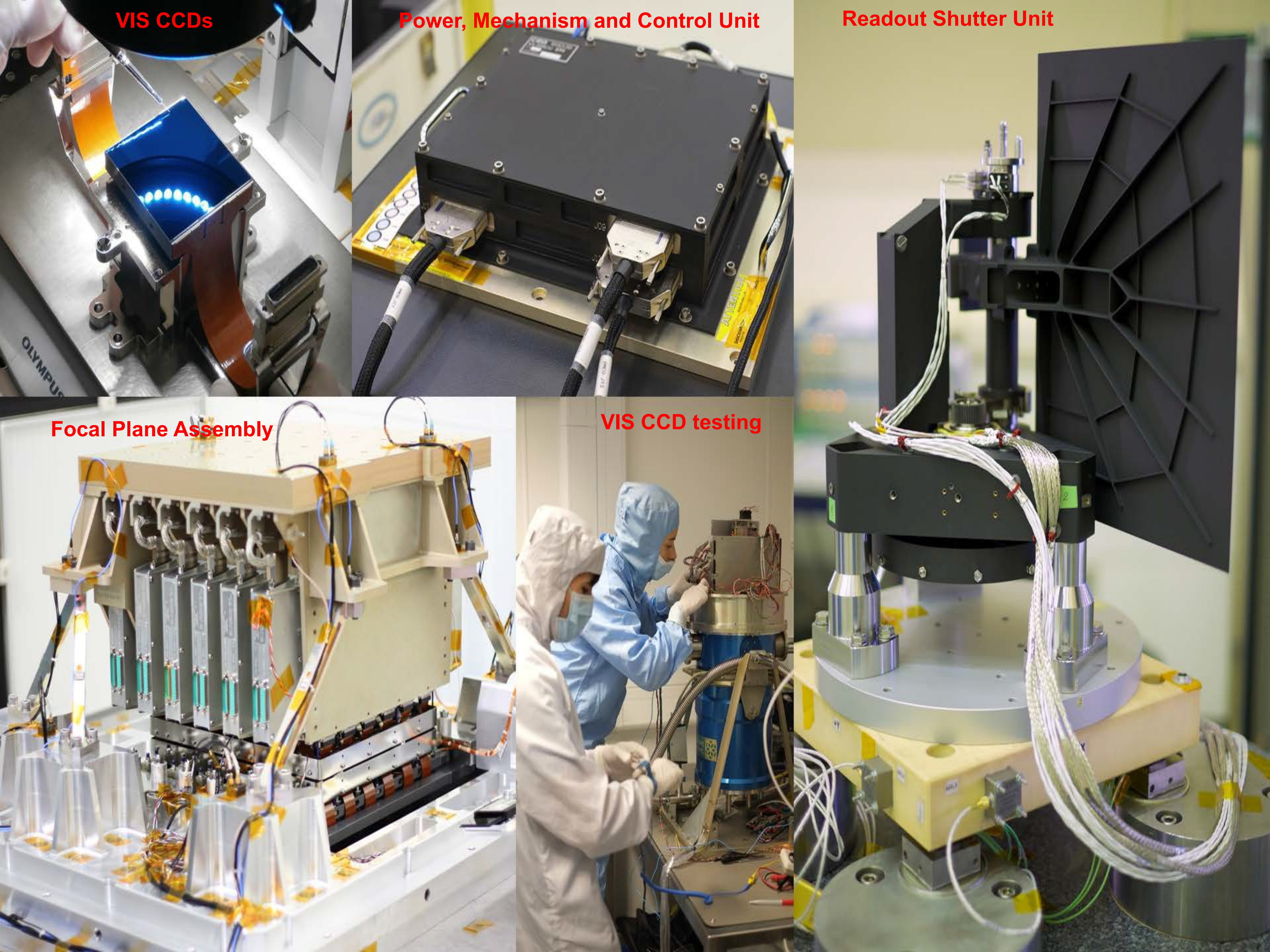


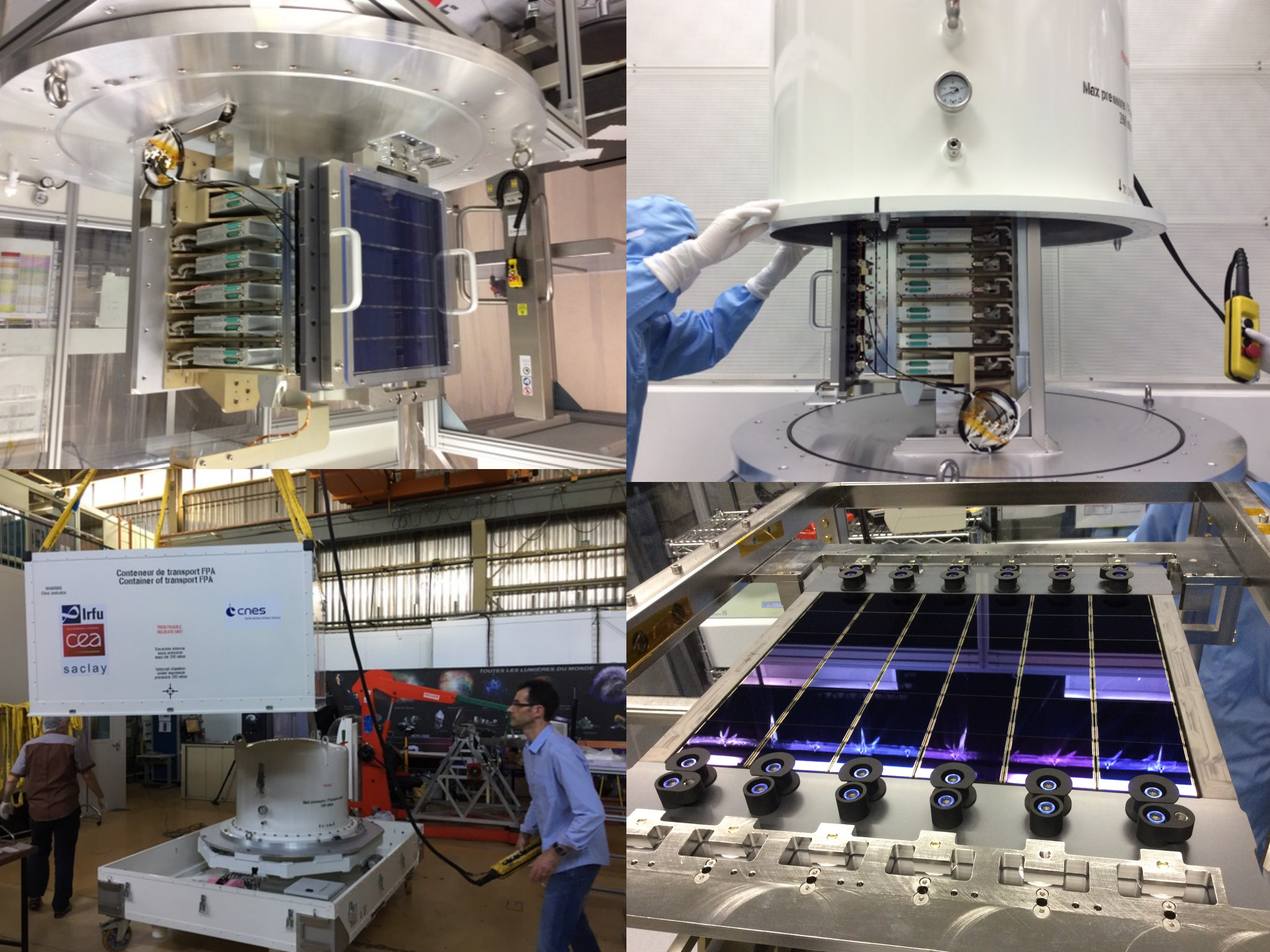
Control and Data Processing Unit








VIS CCDs
Power, Mechanism and Control Unit
Readout Shutter Unit
Focal Plane Assembly
VIS CCD testing

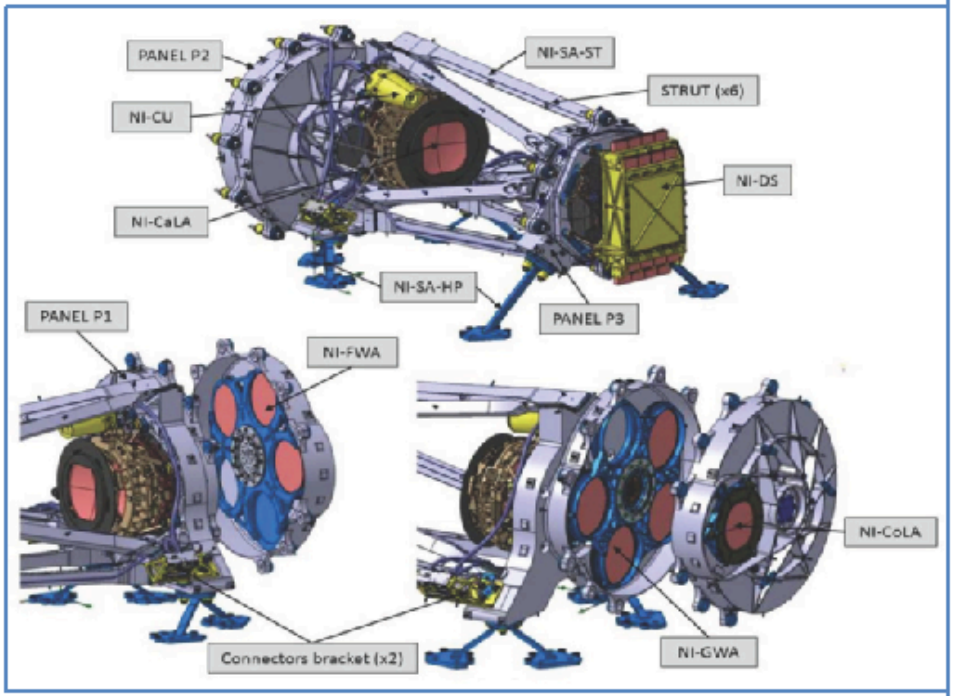


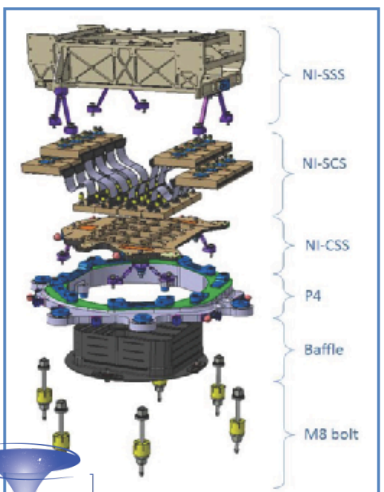
Conteneur de transport FPA
Container of transport FPA
Irfu
cea
saclay
cnes

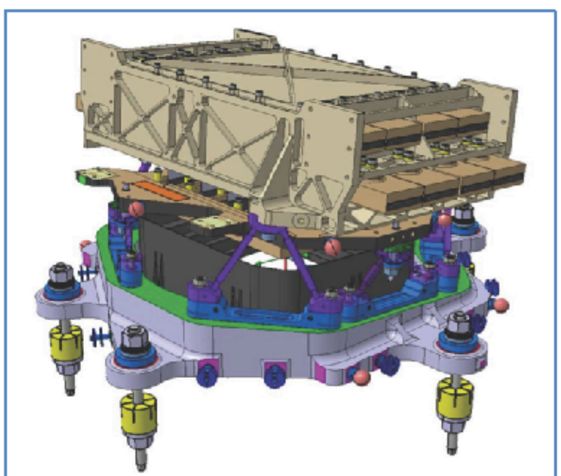
NISP

Courtesy: T. Maciaszek and the NISP team

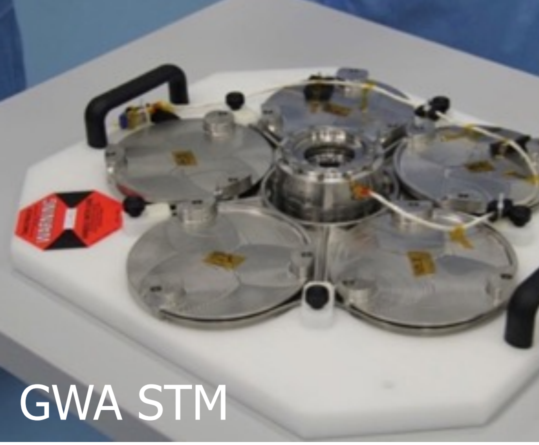
NISP CDR successful in Nov 2016

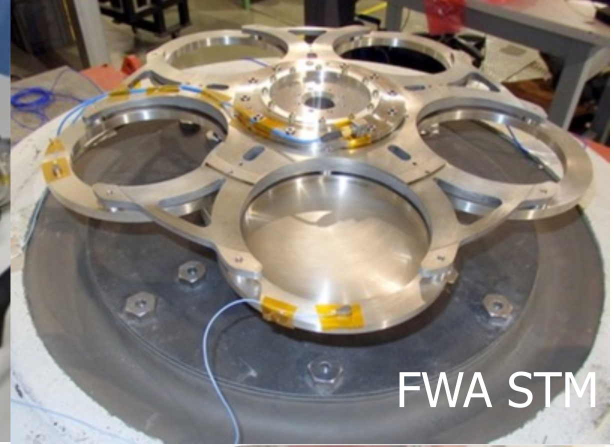






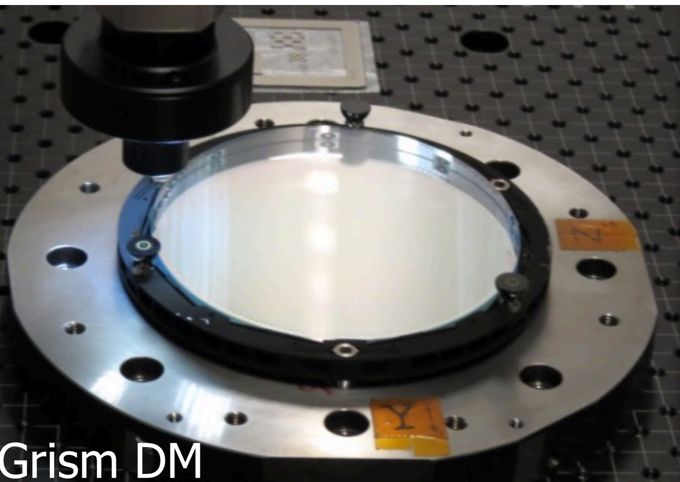
- FoV: 0.55 deg^2
- Mass : 159 kg
- Telemetry: < 290 Gbt/day
- Size: 1m x 0.5 m x 0.5 m
- 16 2kx2K H2GR detectors
- 0.3 arcsec pixel on sky
- Limiting mag, wide survey AB : 24 (5 σ)
- **3 Filters**:
- Y (950-1192nm)
- J (1192, 1544nm)
- H (1544, 2000nm)
- **4 grisms**:
- 1B (920 – 1300) , 1 orientation 0°
- 3R (1250 – 1850), 3 orientations 0°, 90°, 180°

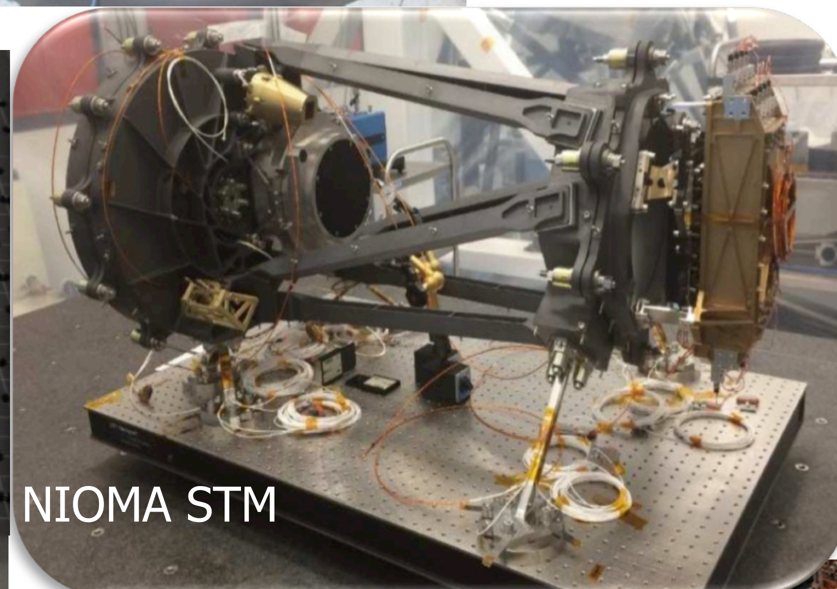


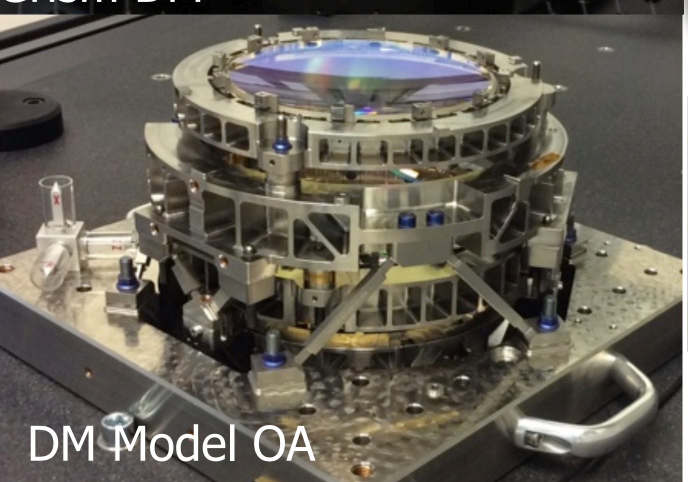


NISP

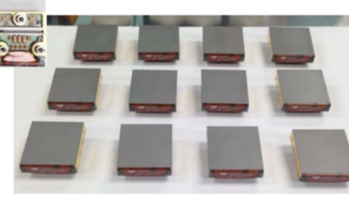
Courtesy::
Euclid
Consortium
NISP team

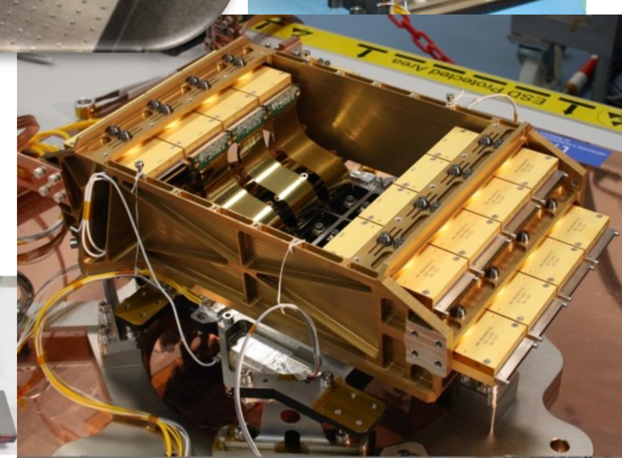






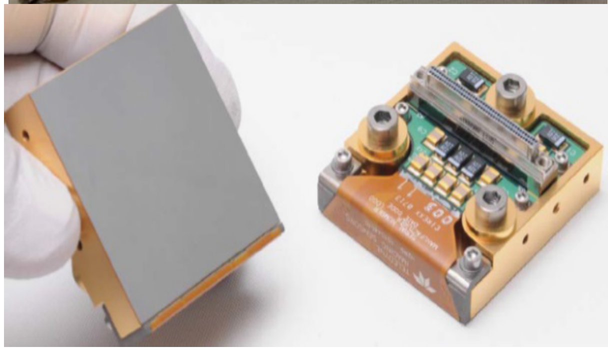
12 flight grade SCA packages were received



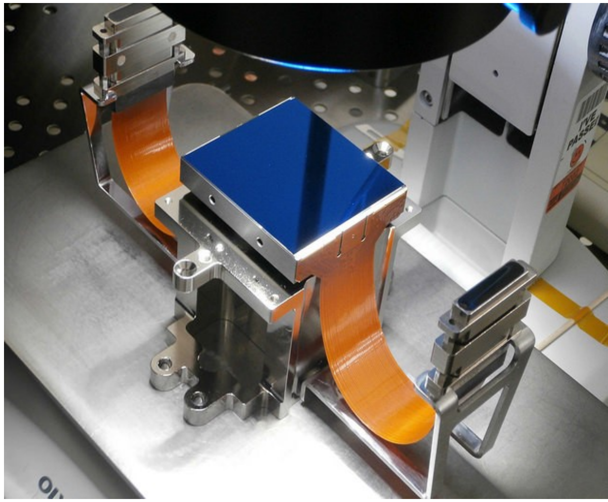


NIR detectors and VIS CCD's

- Delays in FM detector delivery
- NIR HgCdTe detectors (Teledyne), 2040X2040 pixels, 18x18 µm, 2.3 µm cut-off, FW=130,000 e-:
- QE ≥ 90% 1 µm to 2.2 µm
- Spectroscopic noise ≤ 7 e- over 560 s
- Photometric noise ≤ 5 e- over 60 s
- Dark current ≤ 0.005 e-/s/px
- Linearity ≤ 0.7% between 6 ke- and 60 ke-

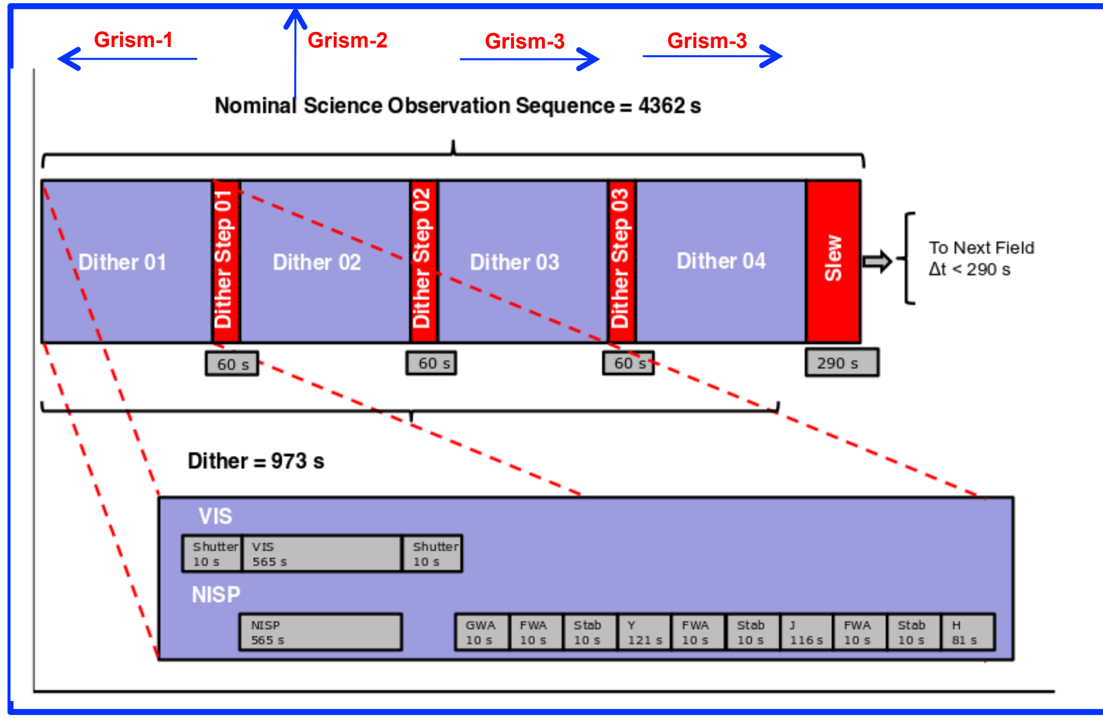


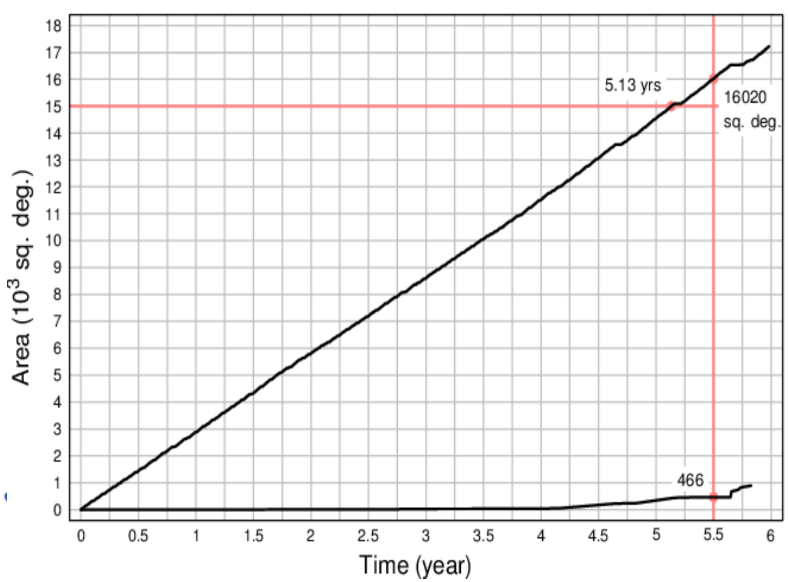
- CDD FM delivery on going
- CCD (e2v), 4096 x 4132 pixels, 12x12 µm FWC=175,000e-
- 4 read-out nodes (in corners)
- SiC package extremely tight flatness
- QE ≥ 70% 500nm to 850nm (95% at 650nm)
- PRNU much better than 2% at all spatial scales
- Noise better than required 3.6 e- at 70 kpix/s

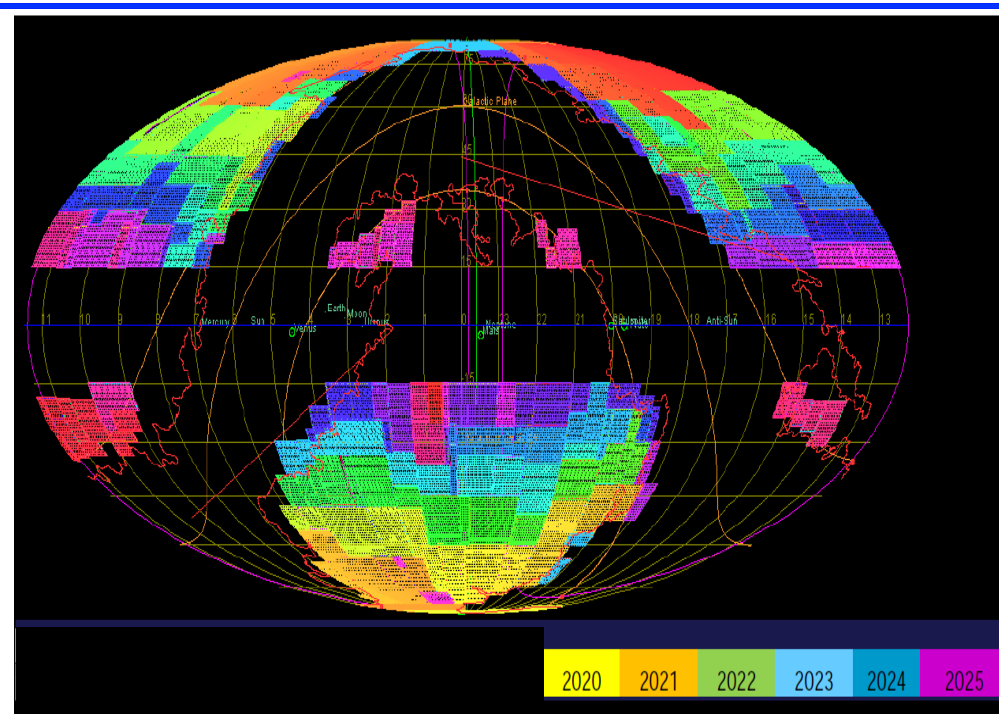


Euclid Survey

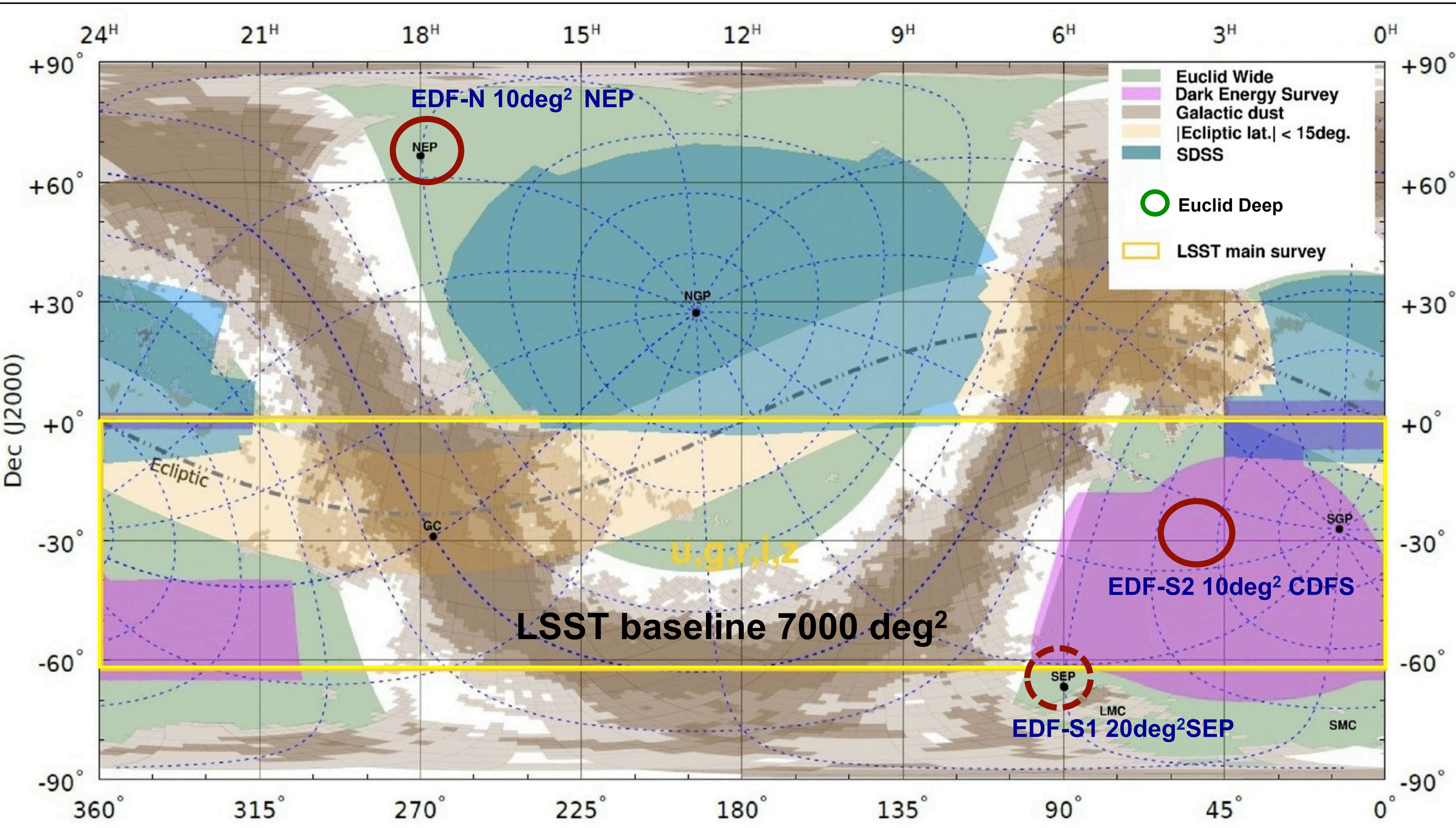
- |b|>30º
- Minimise SAA variations;
- Minimise zodiacal light
  → high ecliptic latitude;
- Low galactic extinction;
- Specific pointed calibration;
- Wide survey: one visit/ field
- Deep survey: many visits







Euclid Wide and Deep Surveys



From J.-C. Cuillandre and the Survey WG

Euclid complementary data

- 45 nights at Keck telescope: spectroscopy on Euclid Wide fields north
- 25 nights at VLT VMOS/KMOS: spectroscopy on Euclid Wide fields south
- 2 nights pilot program at GTC: preparation of a spectroscopic large program

- 5300 hrs of Spitzer satellite, period 13, priority 1 on 2 Euclid Deep field (20 deg2)
- DES+KIDS survey data
- 271 nights at CFHT *u-, r-* band data on Euclid Wide North
- 110 nights at JST/T250 *g-* band data on Euclid Wide North
- Discussions on going with other telescopes

Ground Segment

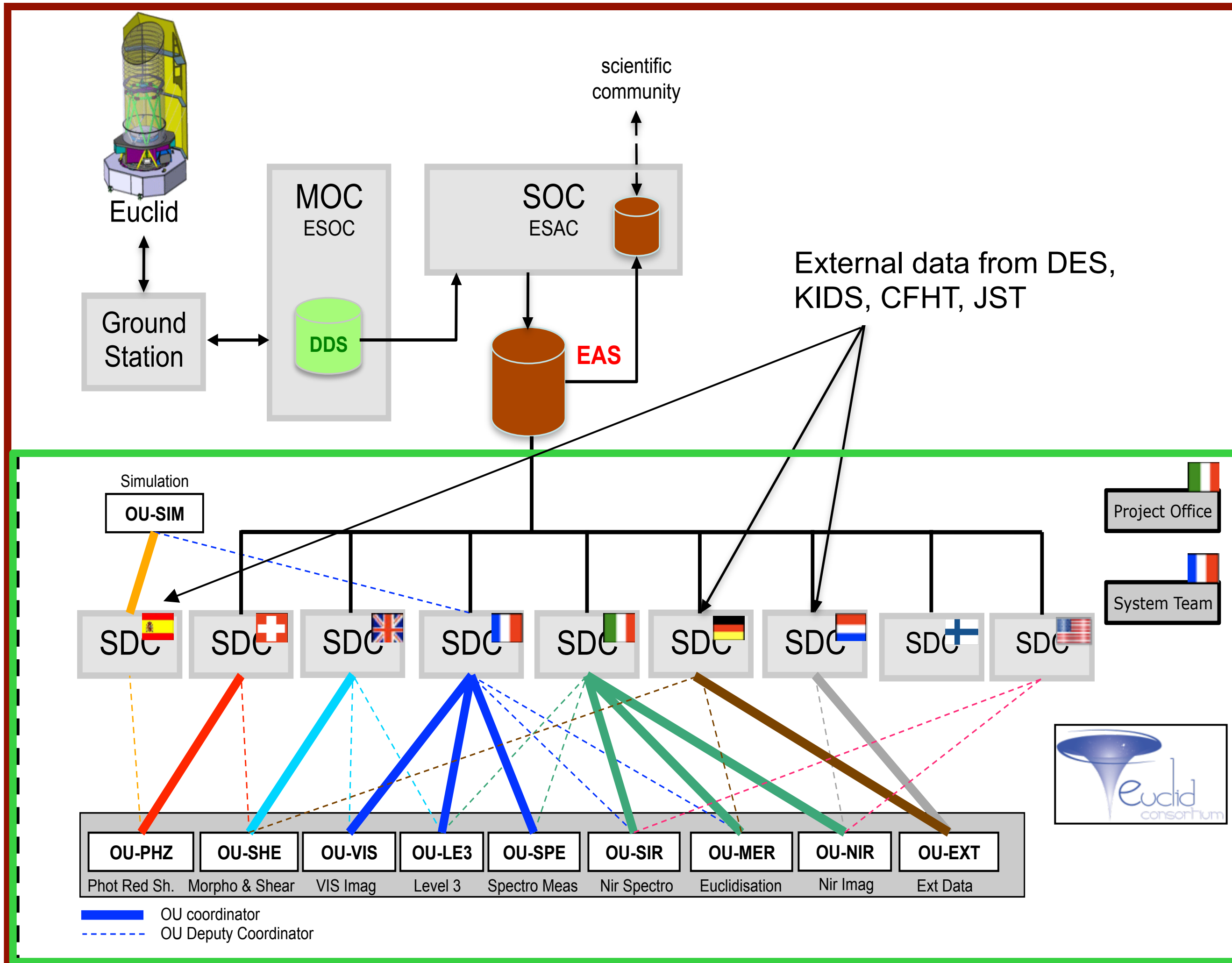
Complex organisation:

- 10 Organisation Units
- 9 Science Data Centers

Data: huge volumes, heterogeneous data sets

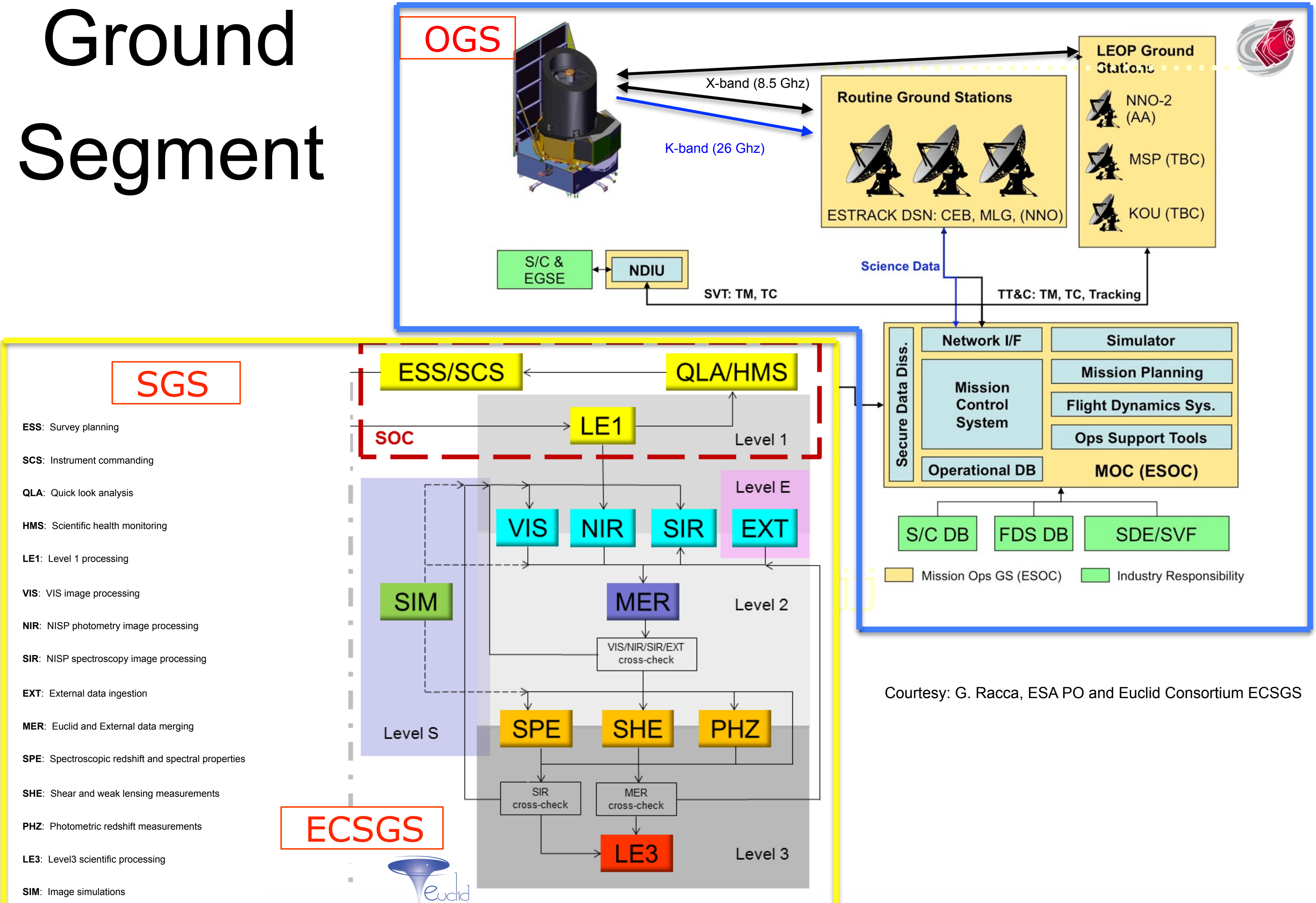
- VIS+NIR imagery, morphometry, photometry , spectroscopy, astrometry, transients
- data ground + space
- ~100 Pbytes
- 1+ million images
- > 10^{10} sources (>3-σ)

SGS Design Review in Jan 2018



Ground Segment

Operation Ground Segment



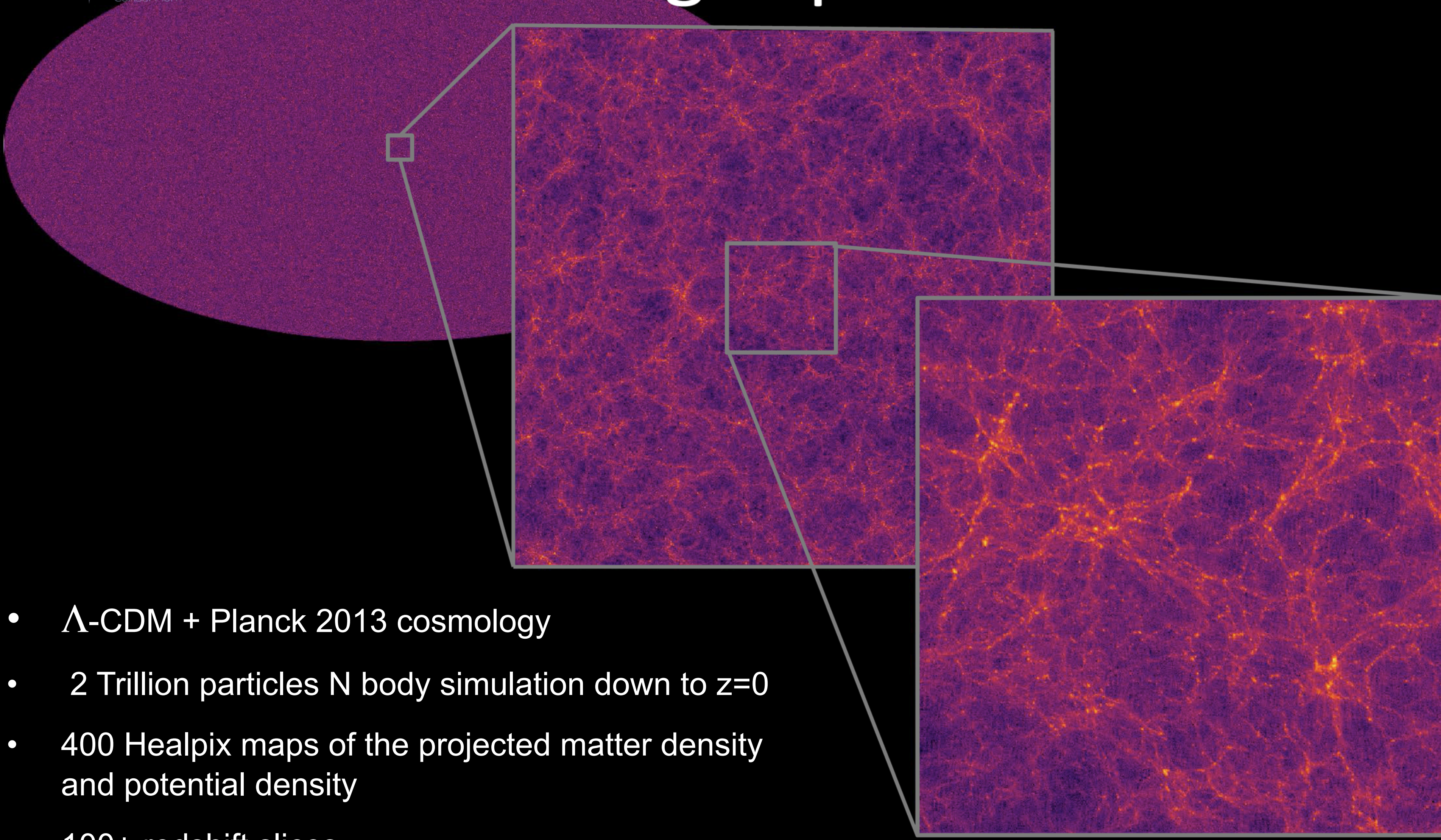
Courtesy: G. Racca, ESA PO and Euclid Consortium ECSGS

Science Ground Segment

Euclid Flagship Simulation:

a tool for Euclid E2E performances

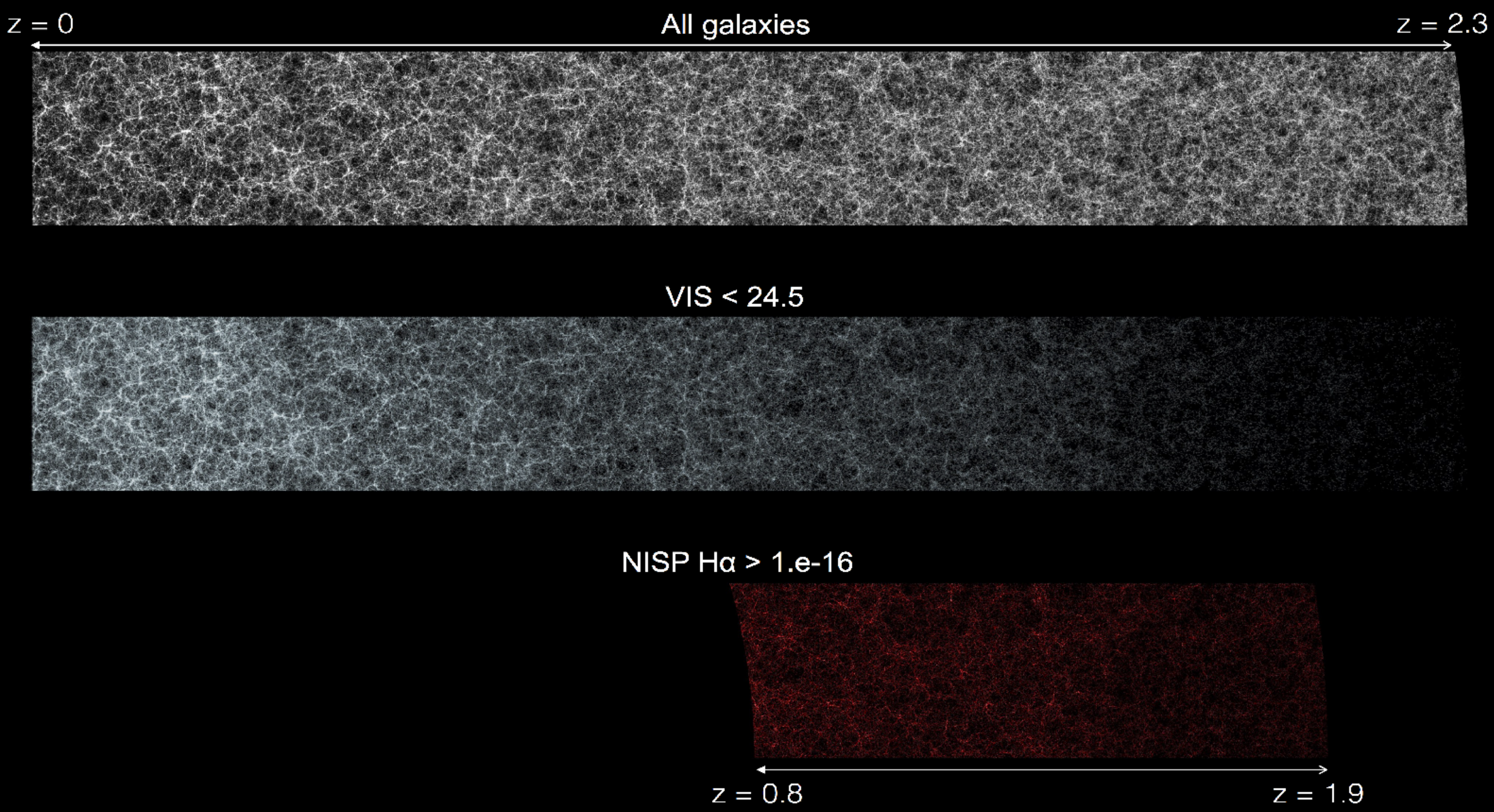
The Euclid Flagship Simulation



From D. Potter, J. Stadel, R. Teyssier

- Λ-CDM + Planck 2013 cosmology
- 2 Trillion particles N body simulation down to z=0
- 400 Healpix maps of the projected matter density and potential density
- 100+ redshift slices
- Consistent mocks for WL and GC

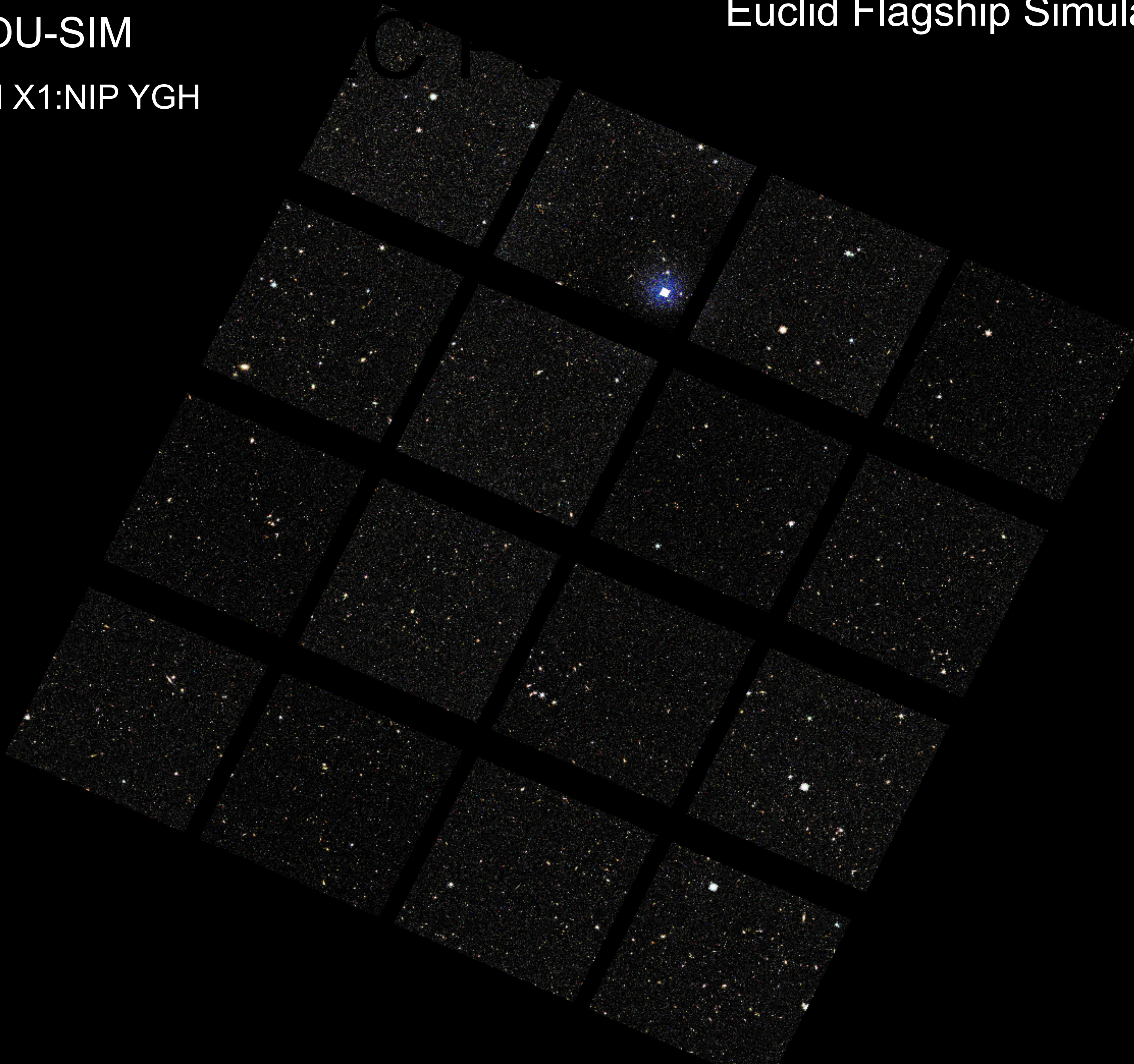
Euclid Flagship Simulation: mock galaxy catalog



Euclid Flagship Simulation

OU-SIM

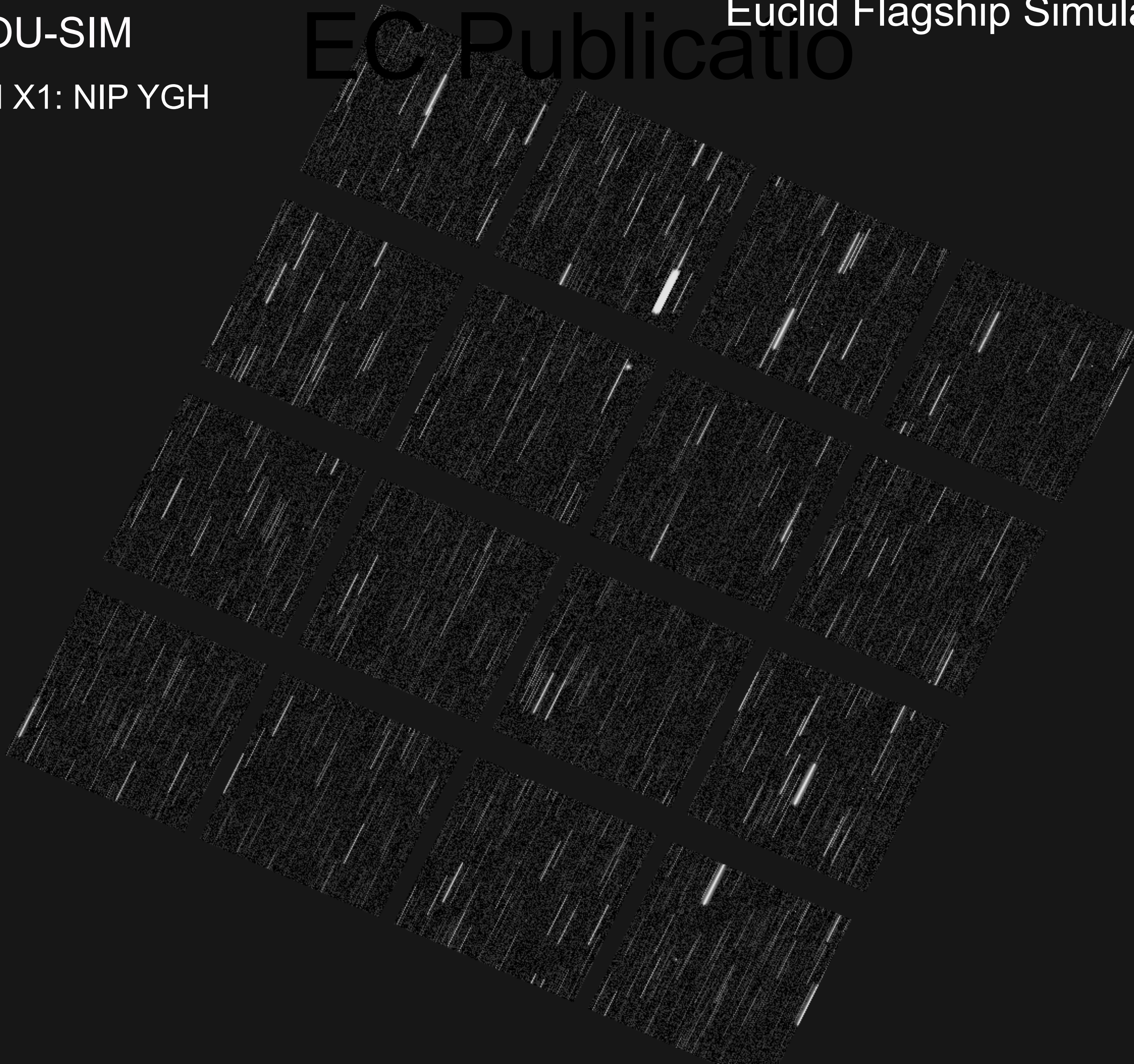
Field X1:NIP YGH



Euclid Flagship Simulation

OU-SIM

Field X1: NIP YGH



Performances and forecasts

Performance Status on Dec 2016

Technical Performance Measure		Requirement	CBE Current
Image Quality			
VIS Channel	FWHM (@ 800nm)	180 mas	160 mas
	ellipticity	15.0%	9.4%
	R2 (@ 800 nm)	0.0576	0.0551
	ellipticity stability σ(εi)	2.00E-04	1.90E-04
	R2 stability σ(R2)/<R2>	1.00E-03	1.00E-04
	Plate scale	0.10 "	0.100 "
NISP Channel	rEE50 (@1486nm)	400 mas	225 mas
	rEE80 (@1486nm)	700 mas	584 mas
	Plate scale	0.30 "	0.299 "
Sensitivity			
VIS SNR (for mAB = 24.5 sources)		10	16.99
NISP-S SNR (@ 1.6um for 2xe-16 erg cm-2		3.5	4.81
NISP- P SNR (for mAB = 24 sources)	Y-band	5	5.89
	J-band	5	6.69
	H-band	5	5.34
NISP-S Performance			
Purity		80%	72%
Completeness		45%	52%
Survey			
Wide Survey Coverage		15,000 deg2	15,000
Survey length [years]		5.5	5.4

From ESA PO

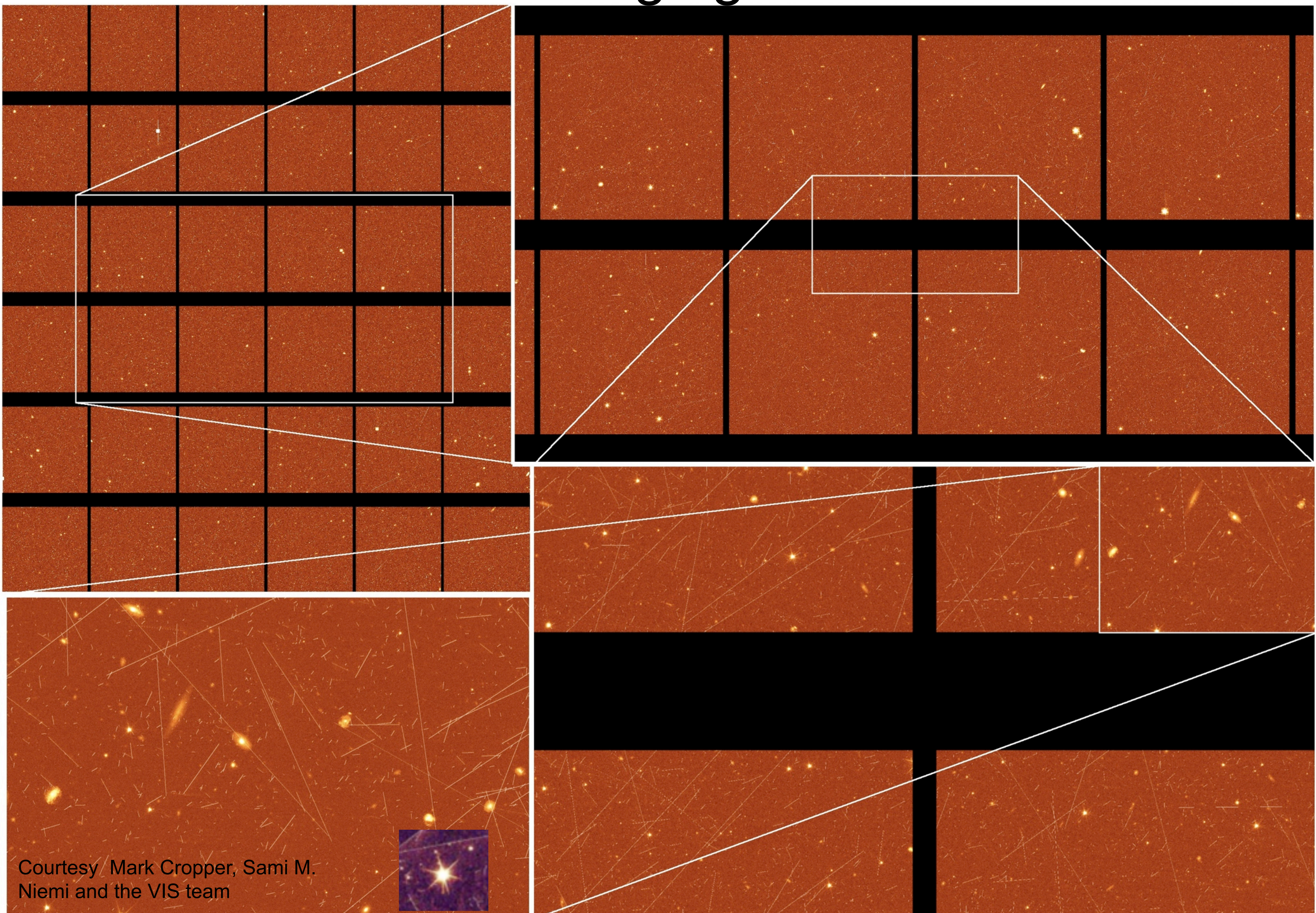
Mission PDR passed in Oct 2015

Euclid performances meet the scientific and survey requirements

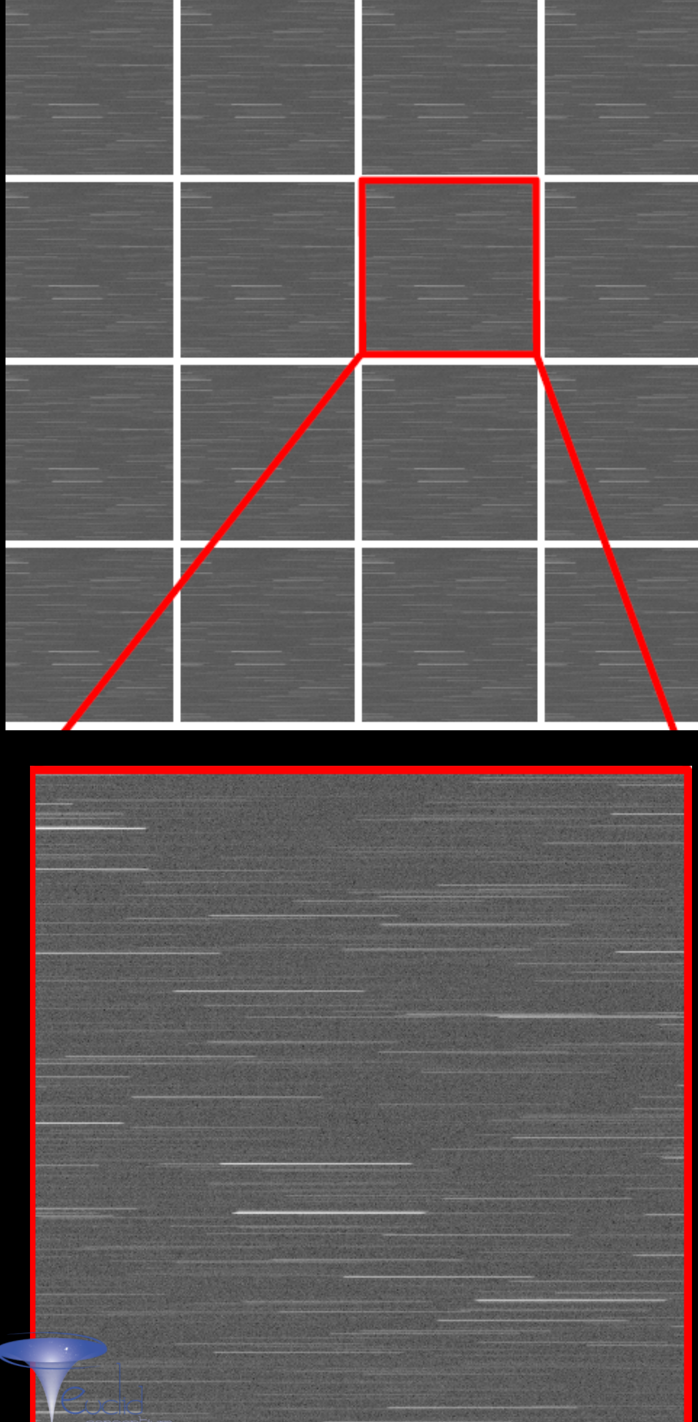
- Image quality of the system fully in line with needs.
- Ellipticity, R^2 stability and Non-convolutive errors performance dictated mainly by ground processing
- *Purity* not compliant with current data processing methods but expected to be recovered with Euclid specific algorithms (not yet installed at this stage).

Mission CDR in MAY 2018

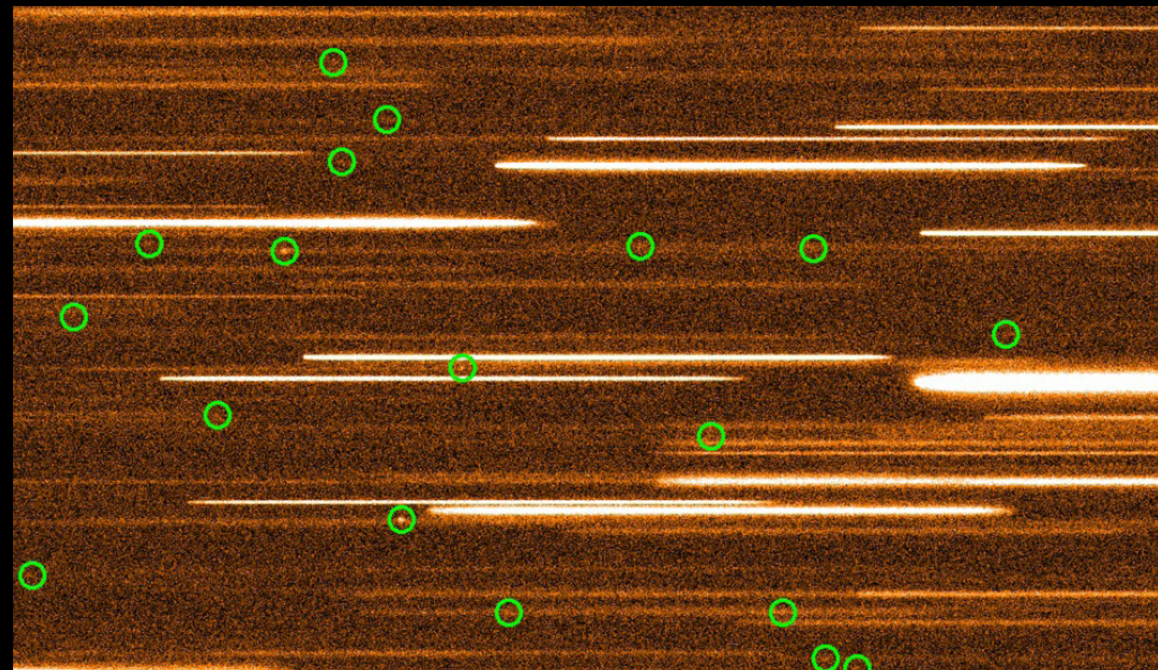
Euclid : VIS imaging instrument



NISP-spectroscopy for Euclid (2015)



From P. Franzetti, B. Garilli, A. Ealet, N. Fourmanoit & J. Zoubian



35 million spectra with at least 3 exposures taken with 3 different orientation.

Cosmology and Fundamental Physics with the Euclid Satellite

Luca Amendola, Stephen Appleby, Anastasios Avgoustidis, David Bacon, Tessa Baker, Marco Baldi, Nicola Bartolo, Alain Blanchard, Camille Bonvin, Stefano Borgani, Enzo Branchini, Clare Burrage, Stefano Camera, Carmelita Carbone, Luciano Casarini, Mark Cropper, Claudia de Rham, Jörg P. Dietrich, Cinzia Di Porto, Ruth Durrer, Anne Ealet, Pedro G. Ferreira, Fabio Finelli, Juan García-Bellido, Tommaso Giannantonio, Luigi Guzzo, Alan Heavens, Lavinia Heisenberg, Catherine Heymans, Henk Hoekstra, Lukas Hollenstein, Rory Holmes, Ole Horst, Zhiqi Hwang, Knud Jahnke, Thomas D. Kitching, Tomi Koivisto, Martin Kunz, Giuseppe La Vacca, Eric Linder, Marisa March, Valerio Marra, Carlos Martins, Elisabetta Majerotto, Dida Markovic, David Marsh, Federico Marulli, Richard Massey, Yannick Mellier, Francesco Montanari, David F. Mota, Nelson J. Nunes, Will Percival, Valeria Pettorino, Cristiano Porciani, Claudia Quercellini, Justin Read, Massimiliano Rinaldi, Domenico Sapone, Ignacy Sawicki, Roberto Scaramella, Constantinos Skordis, Fergus Simpson, Andy Taylor, Shaun Thomas, Roberto Trotta, Licia Verde, Filippo Vernizzi, Adrian Vollmer, Yun Wang, Jochen Weller, Tom Zlosnik
(The Euclid Theory Working Group)[1]

[1] Please contact euclidtheoryreview@gmail.com for questions and comments.

Abstract

Euclid is a European Space Agency medium-class mission selected for launch in 2020 within the Cosmic Vision 2015 – 2025 program. The main goal of Euclid is to understand the origin of the accelerated expansion of the universe. Euclid will explore the expansion history of the universe and the evolution of cosmic structures by measuring shapes and red-shifts of galaxies as well as the distribution of clusters of galaxies over a large fraction of the sky.

Although the main driver for Euclid is the nature of dark energy, Euclid science covers a vast range of topics, from cosmology to galaxy evolution to planetary research. In this review we focus on cosmology and fundamental physics, with a strong emphasis on science beyond the current standard models. We discuss five broad topics: dark energy and modified gravity, dark matter, initial conditions, basic assumptions and questions of methodology in the data analysis.

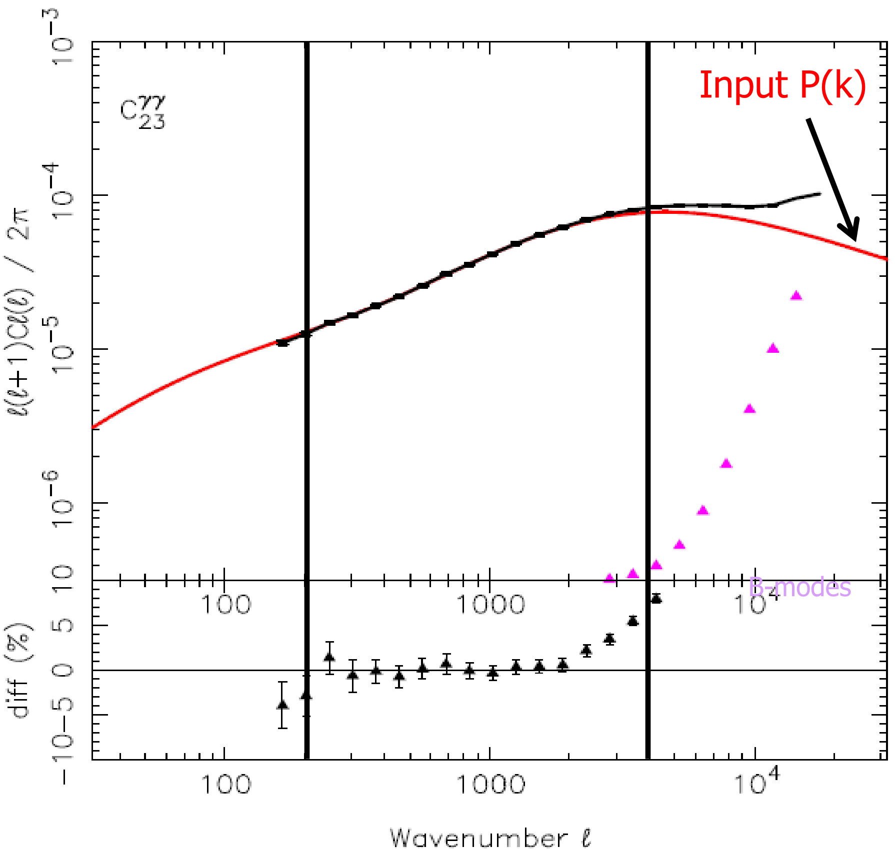
This review has been planned and carried out within Euclid's Theory Working Group and is meant to provide a guide to the scientific themes that will underlie the activity of the group during the preparation of the Euclid mission.

arXiv:1606.00180

Euclid consortium

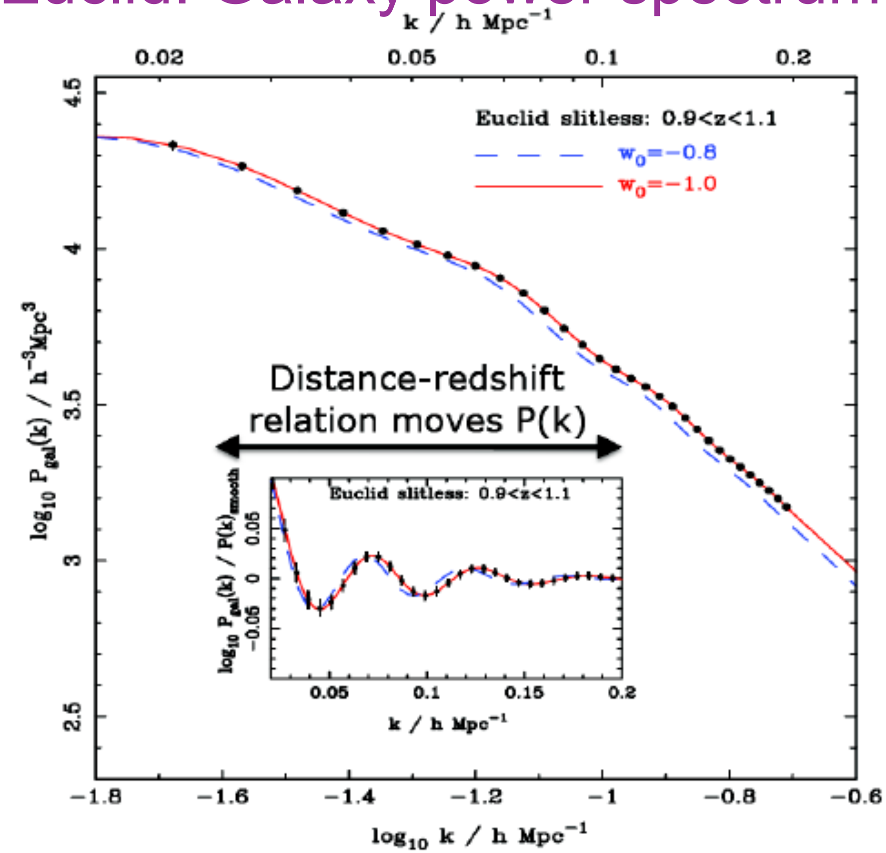
Euclid: combining WL and GC data

Euclid : DM power spectrum



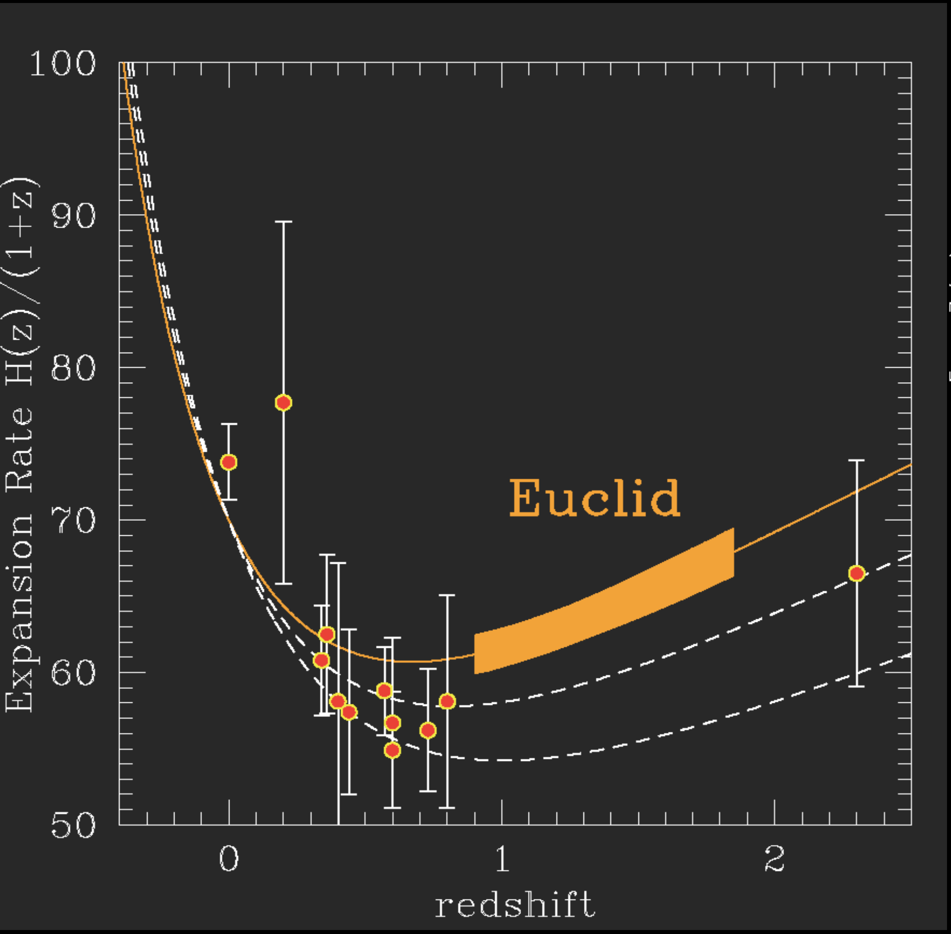
- Tomographic WL shear cross-power spectrum for 0.5 < z < 1.0 and 1.0 < z < 1.5 bins.
- Percentage difference [*expected* – *measured*] power spectrum: recovered to 1% .

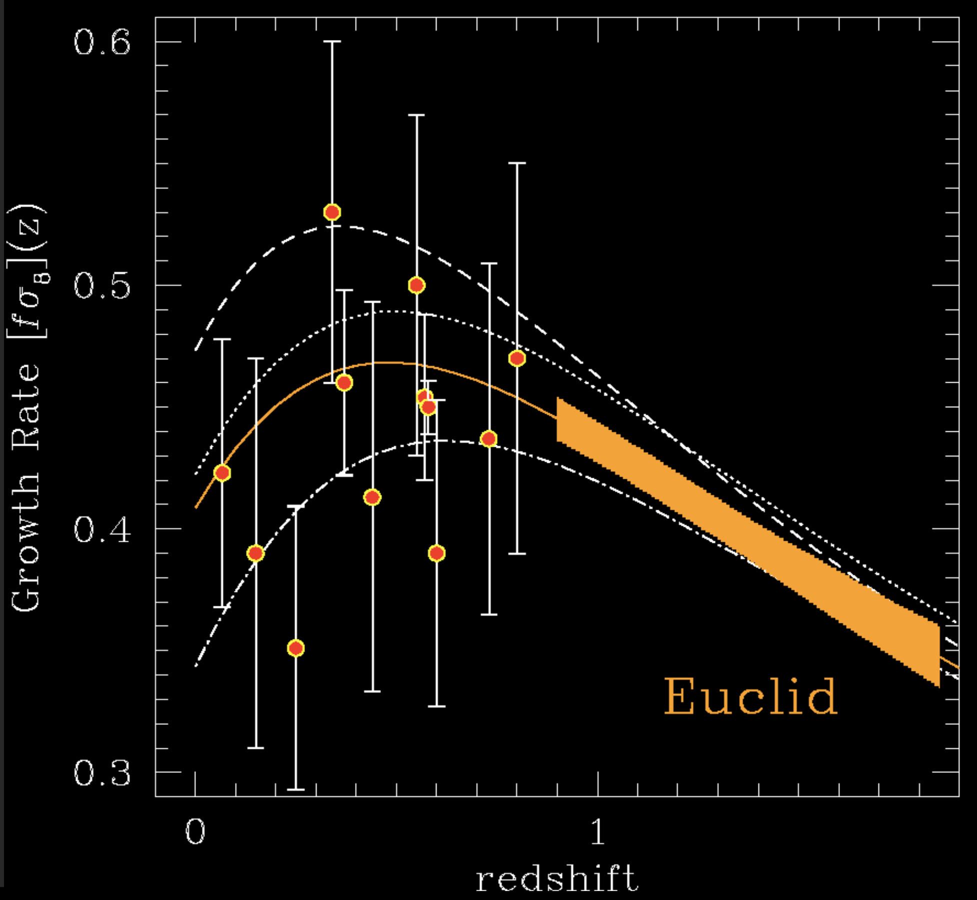
Euclid: Galaxy power spectrum



- $V_{eff} \approx 19\ h^{-3}\ Gpc^3 \approx 75$x larger than SDSS
- Redshifts 0.7<*z*<1.85
- Percentage difference [*expected* – *measured*] power spectrum: recovered to 1% .

Exploration of DE models with Euclid (redshifts only)



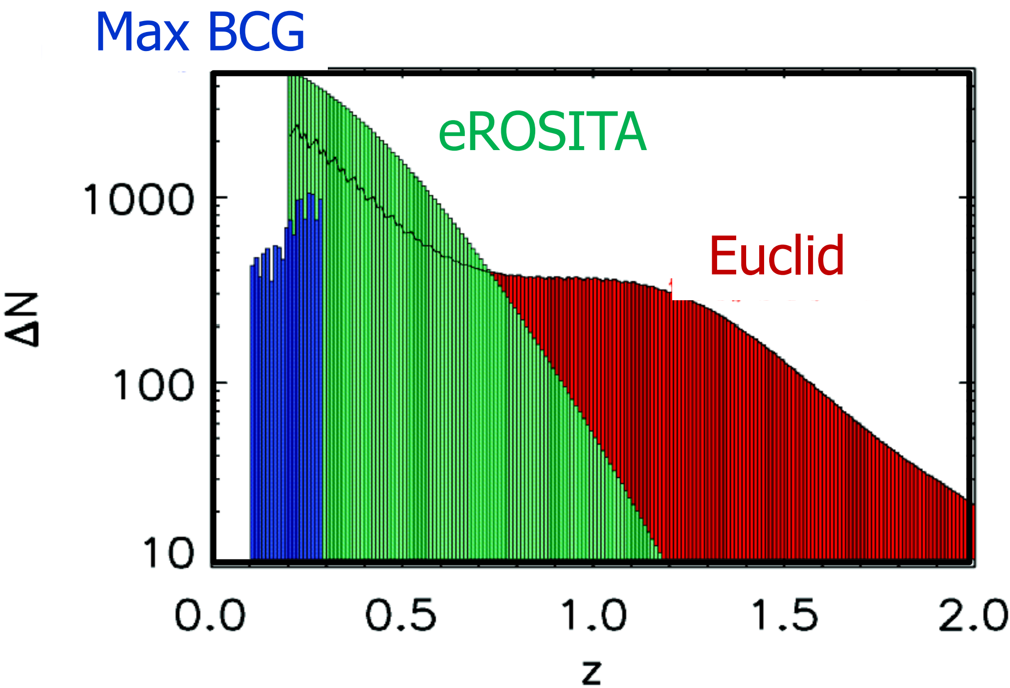


From R. Guzzo and the SWG-GC group 2016

Clusters of galaxies with Euclid

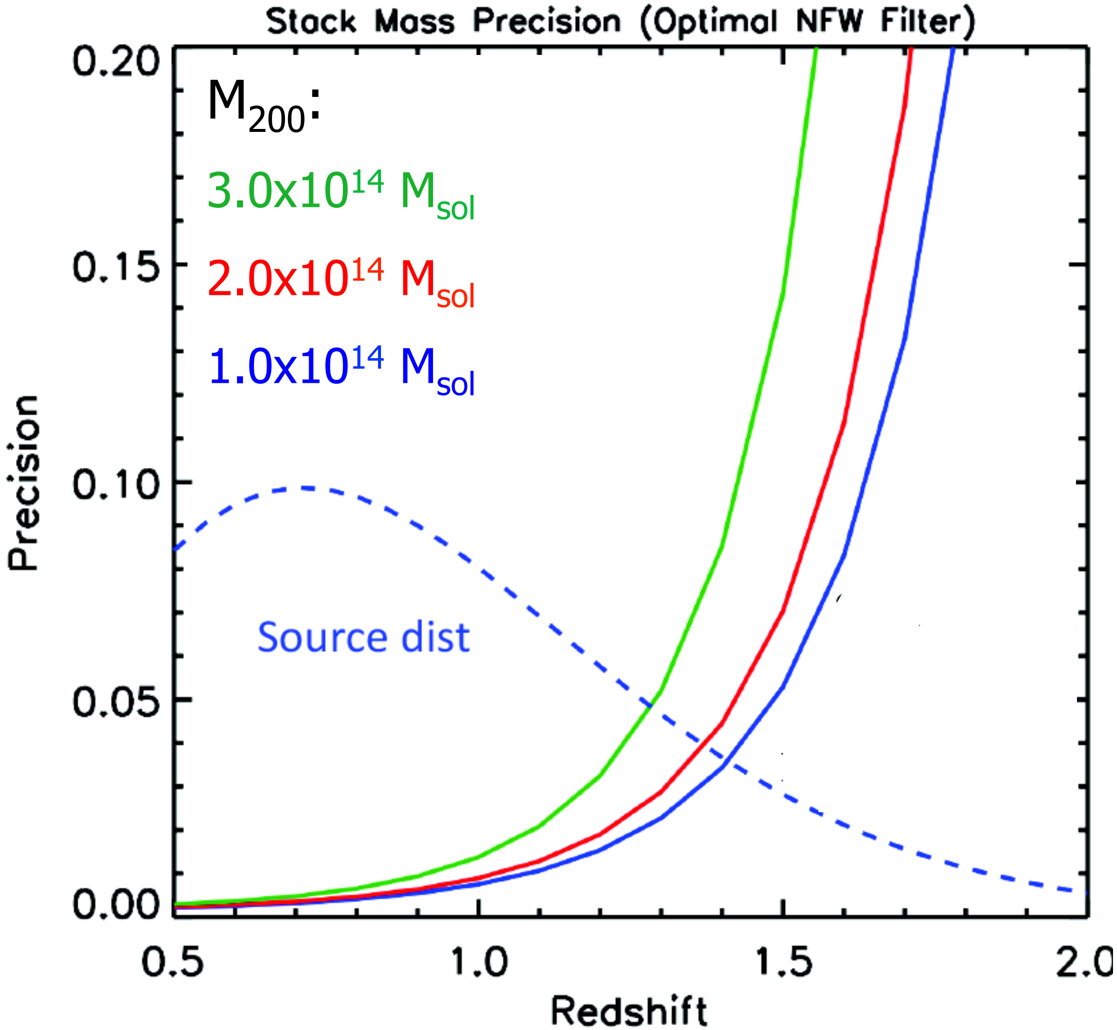
- Probe of peaks in density distribution
- Nb density of high mass, high redshift clusters very sensitive to
  - primordial non-Gaussianity and
  - deviations from standard DE models
- Euclid data will get for free:
  - Λ-CDM: all clusters with M>2 .10^{14} Msol detected at 3-σ up to z=2
    - → 60,000 clusters with 0.2<z<2 ,
    - → 1.8 10^4 clusters at z > 1.
  - ~ 5000 giant gravitational arcs
    - → accurate masses for the whole sample of clusters
    - → Dark matter density profiles on scales >100 kpc

→ Synergy with Planck and eROSITA, targets for MSE, 4MOST, MOONS, PFS



Scaling relations with Euclid Clusters

Expected precision on the mean mass of clusters with gravitational shear in bin of $\Delta\log(M_{200})=0.2$ and $\Delta z=0.1$



- Survey of 15,000 deg^2
- Λ-CDM Planck cosmology
- Tinker mass function
- Shape noise of 0.3

« Euclid has the potential to calibrate the mean mass, and hence the scaling relations, to 1% out to z=1.0 and to 10% out to z=1.6 »

Sartoris et al 2015

Euclid forecast: Primary Program

Ref: Euclid RB arXiv: 1110.3193	Modified Gravity	Dark Matter	Initial Conditions	Dark Energy		
Parameter	γ	m_ν /eV	f_{NL}	w_p	w_a	FoM $= 1/(\Delta w_0 \times \Delta w_a)$
Euclid primary (WL+GC)	0.010	0.027	5.5	0.015	0.150	430
EuclidAll (clusters,ISW)	**0.009**	**0.020**	**2.0**	**0.013**	**0.048**	**1540**
Euclid+Planck	0.007	0.019	2.0	0.007	0.035	**6000 →**
Current (2009)	**0.200**	**0.580**	**100**	**0.100**	**1.500**	**~10**
Improvement Factor	**30**	**30**	**50**	**>10**	**>40**	**>400**

Laureijs et al 2011

DE equation of state: $P/\rho = w$, and $w(a) = w_p + w_a(a_p - a)$

From Euclid data alone, get FoM=$1/(\Delta w_a \times \Delta w_p)$ > 400→ ~1% precision on w's.

Growth rate of structure formation: $f \sim \Omega^\gamma$; .

Notice neutrino constraints -> minimal mass possible ~ 0.05 eV

Euclid forecast: neutrinos and relativistics species

Amendola et al 2016	General cosmology					
fiducial →	$\Sigma = 0.3\,\mathrm{eV}^a$	$\Sigma = 0.2\,\mathrm{eV}^a$	$\Sigma = 0.125\,\mathrm{eV}^b$	$\Sigma = 0.125\,\mathrm{eV}^c$	$\Sigma = 0.05\,\mathrm{eV}^b$	$N_{\mathrm{eff}} = 3.04^d$
EUCLID+Planck	0.0361	0.0458	0.0322	0.0466	0.0563	0.0862
	ΛCDM cosmology					
EUCLID+Planck	0.0176	0.0198	0.0173	0.0218	0.0217	0.0224

Amendola et al 2016

[a] for degenerate spectrum: $m_1 \approx m_2 \approx m_3$; [b] for normal hierarchy: $m_3 \neq 0$, $m_1 \approx m_2 \approx 0$
[c] for inverted hierarchy: $m_1 \approx m_2$, $m_3 \approx 0$; [d] fiducial cosmology with massless neutrinos

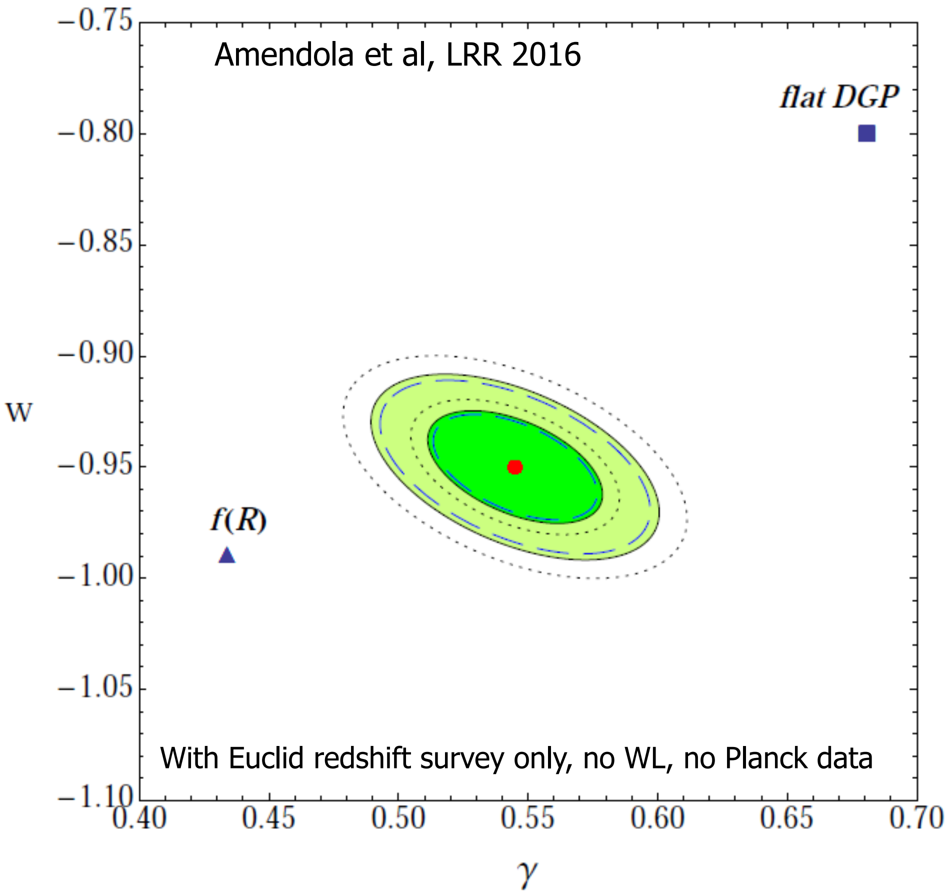
- **If Σ >0.1 eV**

→ Euclid spectroscopic survey will be able to determine the neutrino mass scale independently of the model cosmology assumed.

- **If Σ <0.1 eV**

→ the sum of neutrino masses, and in particular the minimum neutrino mass required by neutrino oscillations, can be measured in the context of the ΛCDM

Euclid: predicted performances from GC

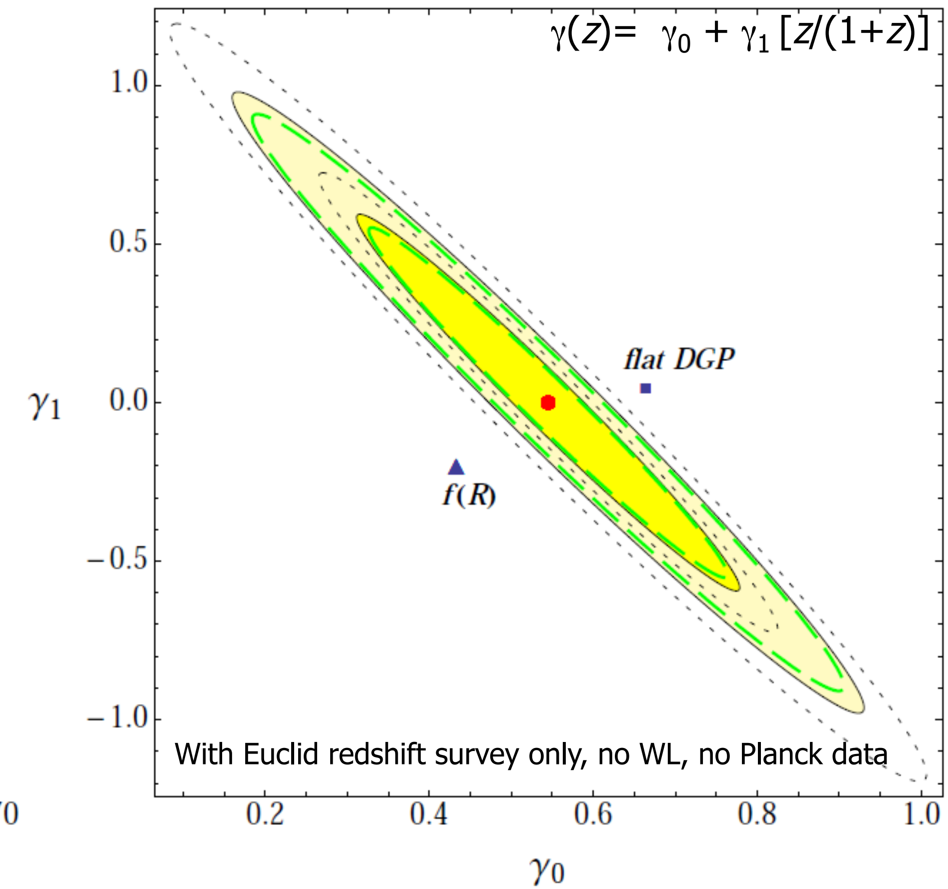


$1/2{-}\sigma$ marginalised probability regions, constant γ and w

Reference = green regions

Optimistic = blue long-dashed ellipses

Pessimistic= black short-dashed ellipses



$1{-}\sigma$, $2{-}\sigma$ marginalised probability regions for γ_0 and γ_1

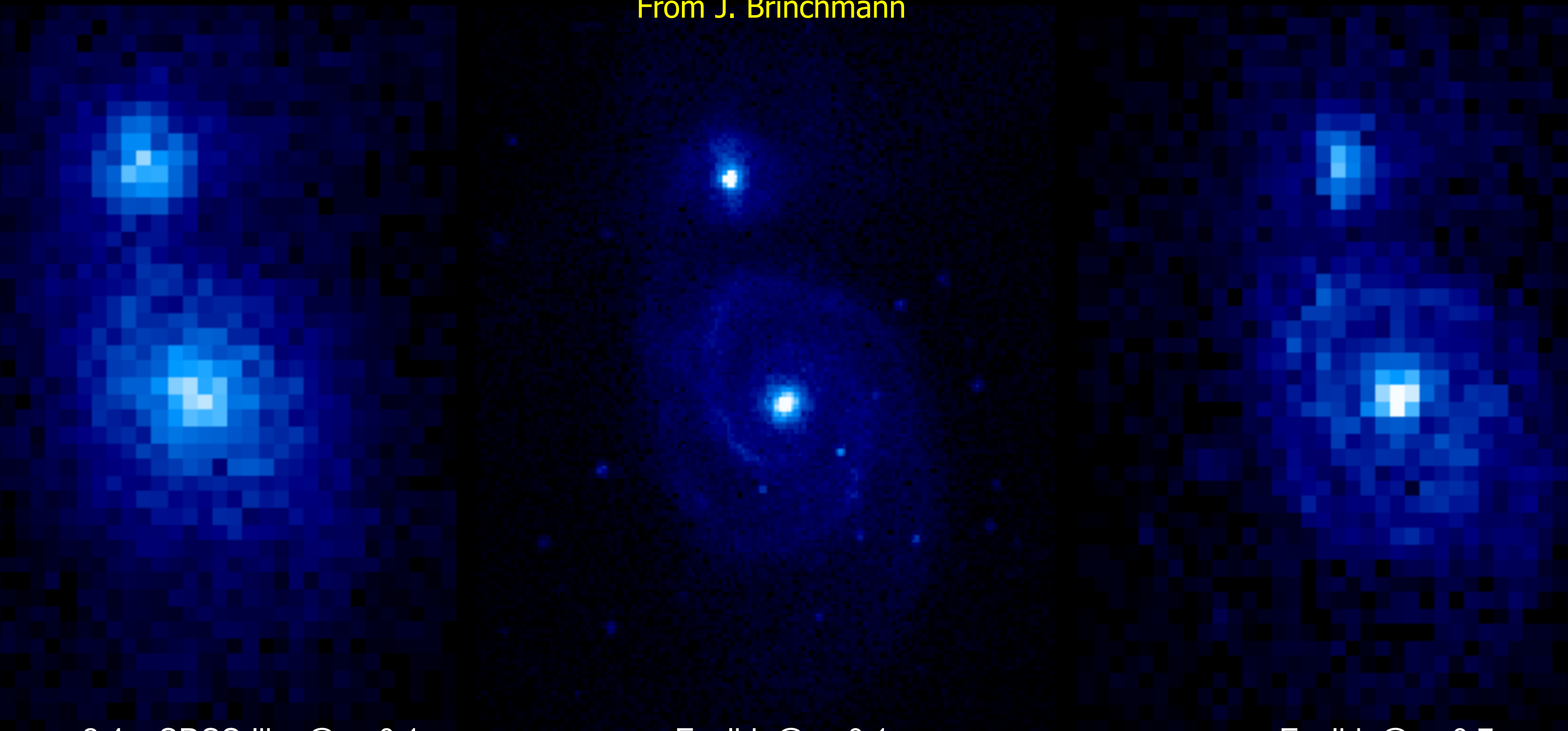
Reference = yellow regions

Optimistic = green long-dashed ellipses

Pessimistic= black doted ellipses

VIS: Simulation of M51

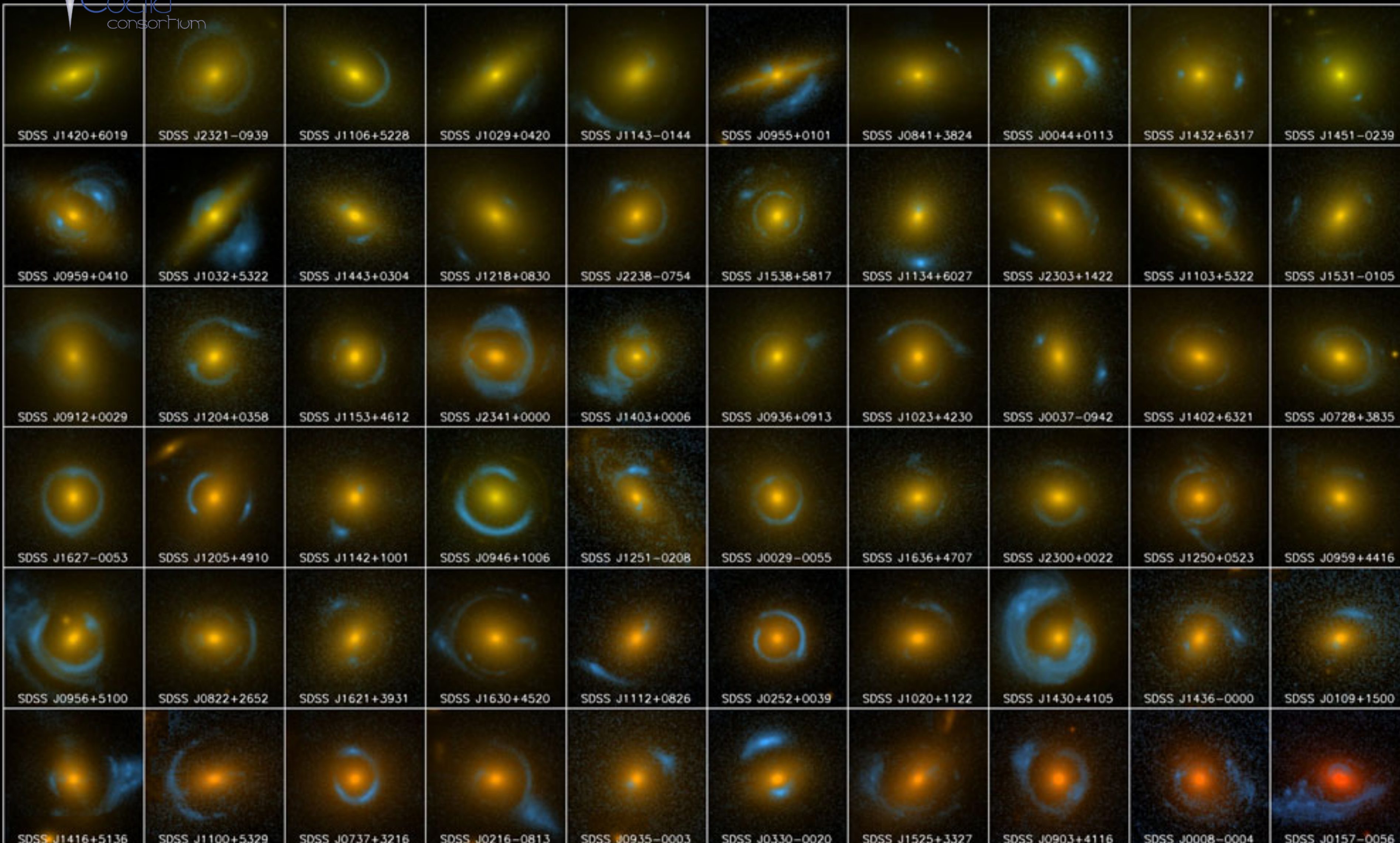
From J. Brinchmann



2.4m SDSS-like @ z=0.1 Euclid @ z=0.1 Euclid @ z=0.7

- Euclid will get the resolution of SDSS but at z=1 instead of z=0.05.
- Euclid will be 3 magnitudes deeper → Euclid Legacy = Super-Sloan Survey

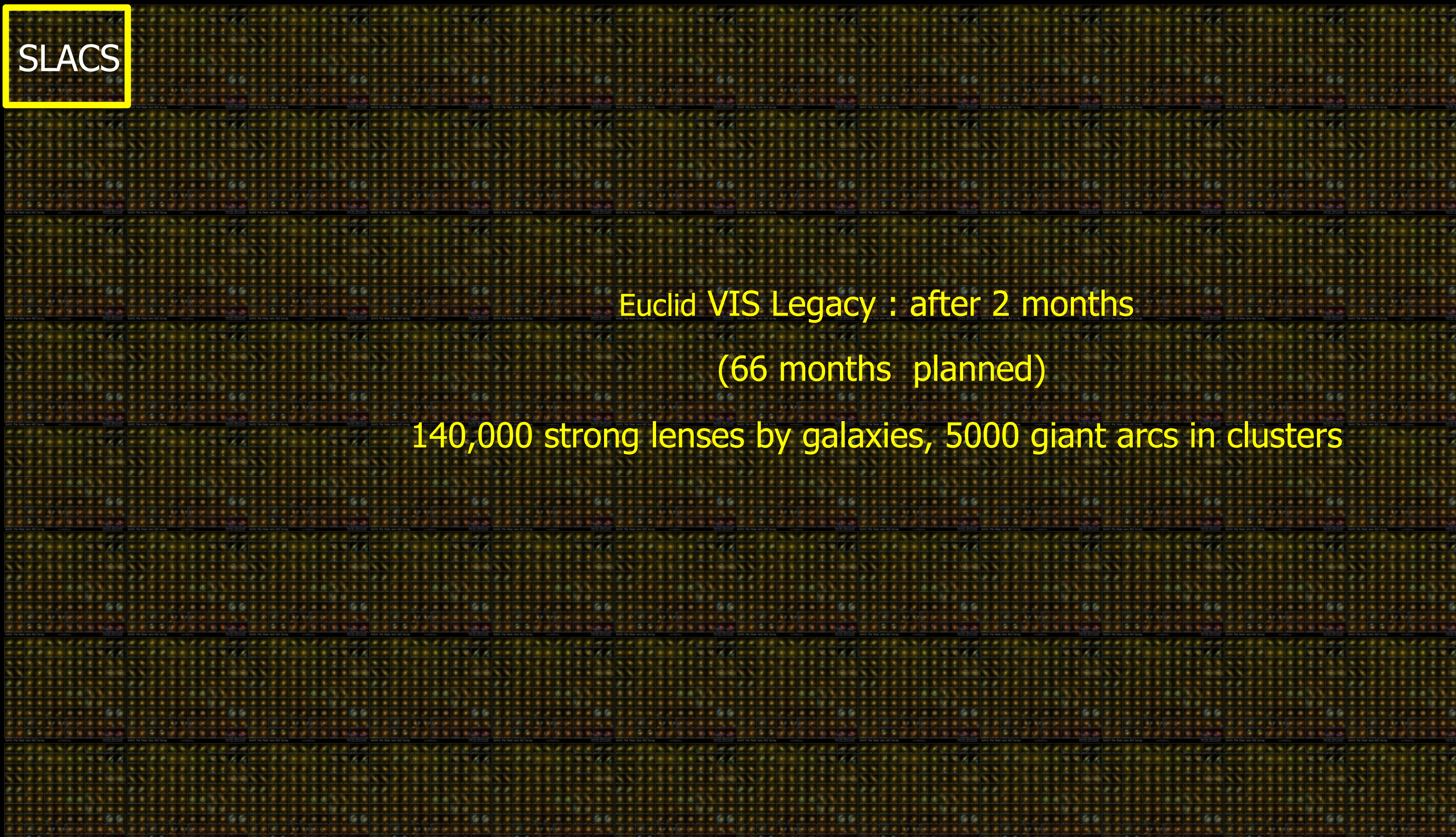
SLACS (~2010 - HST): gravitational lensing by galaxies



SLACS: The Sloan Lens ACS Survey www.SLACS.org

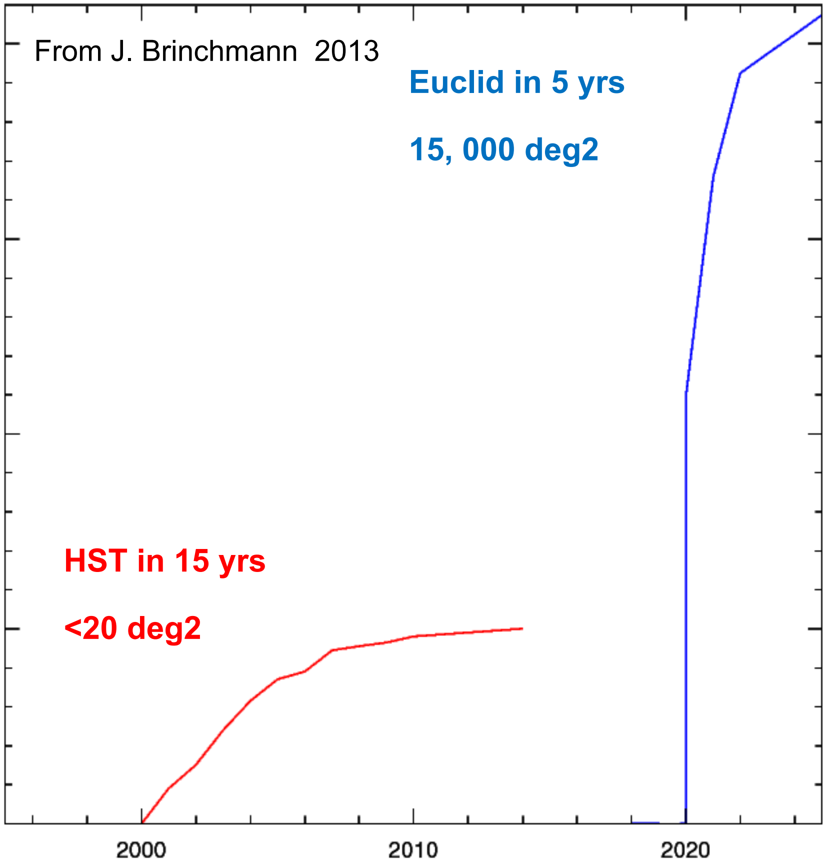
A. Bolton (U. Hawai'i IfA), L. Koopmans (Kapteyn), T. Treu (UCSB), R. Gavazzi (IAP Paris), L. Moustakas (JPL/Caltech), S. Burles (MIT)

Image credit: A. Bolton, for the SLACS team and NASA/ESA


SLACS
Euclid VIS Legacy : after 2 months
(66 months planned)
140,000 strong lenses by galaxies, 5000 giant arcs in clusters

Euclid and the next generation wide field VIS/NIR surveys

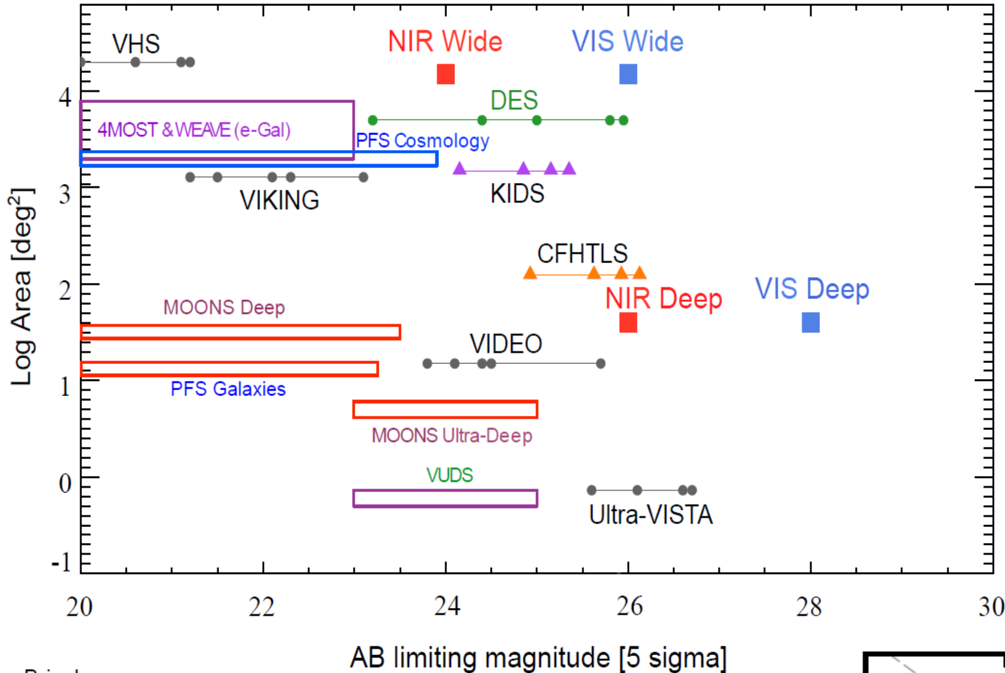
Objects	Euclid	Before Euclid
Galaxies at 1 < z < 3 with precise mass measurement	$\sim 2 \times 10^8$	$\sim 5 \times 10^6$
Massive galaxies (1< z< 3)	Few hundreds	Few tens
H α Emitters with metal abundance measurements at z~2-3	$\sim 4\ 10^7$?	$\sim 10^4$?
Galaxies in clusters of galaxies at z > 1	$\sim 1.8 \times 10^4$	$\sim 10^3$?
Active Galactic Nuclei galaxies (0.7 < z< 2)	$\sim 10^4$	$<10^3$
Dwarf galaxies	$\sim 10^5$	
T_{eff} ~400K Y dwarfs	~few 10^2	<10
Lensing galaxies with arcs and rings	~150,000	~10-1000
Quasars at z > 8	~30	None



- Targets for JWST, E-ELT, TMT, Subaru, VLT, 4MOST, MSE, etc…
- Synergy with LSST, eROSITA, Subaru/HSC, WFIRST, Planck, SKA

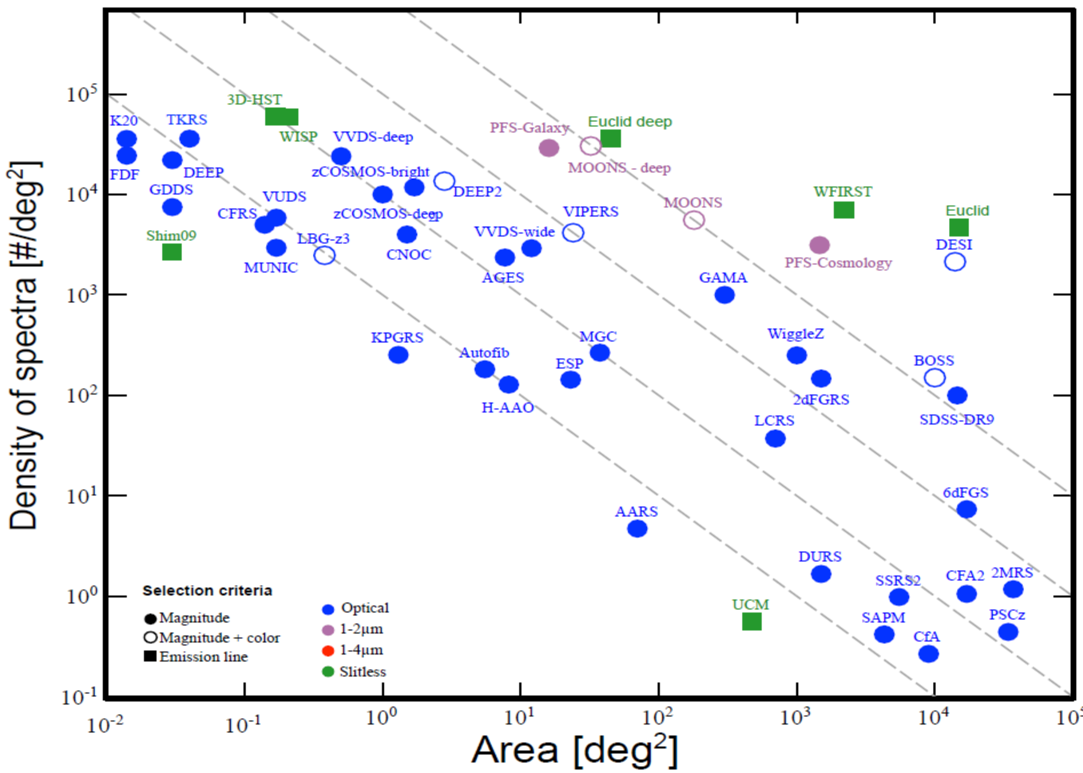
Euclid in the competition

Euclid and other surveys



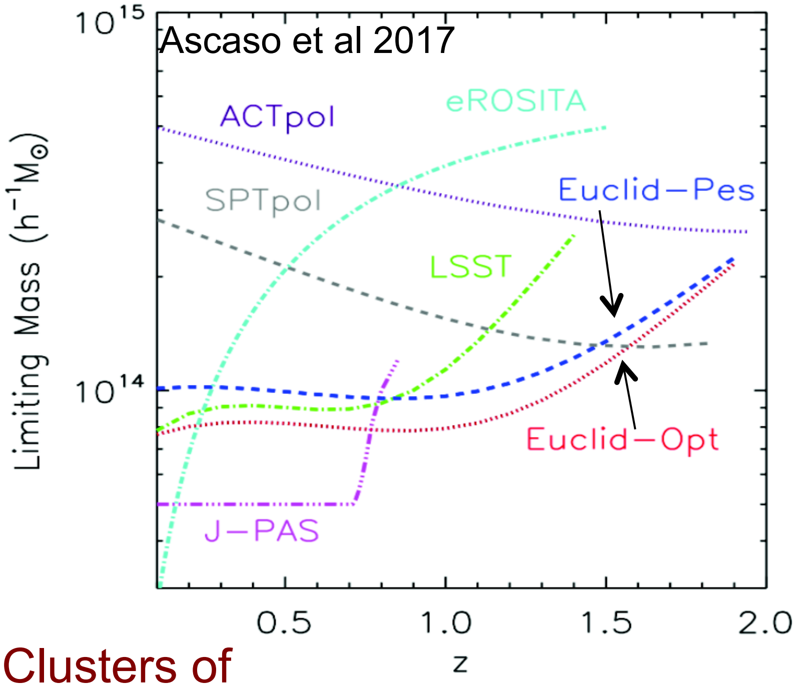
From Brinchmann

Imaging surveys



Spectroscopic surveys

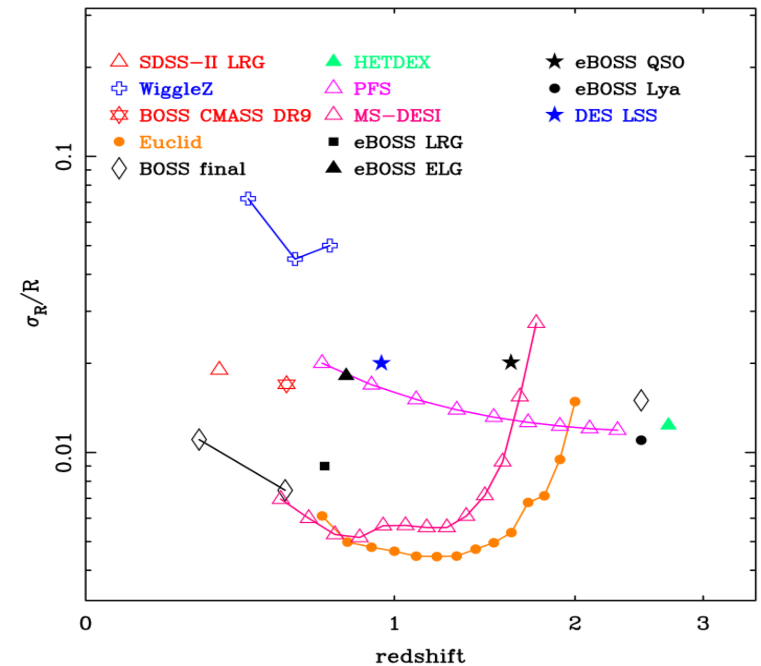
Euclid and competition

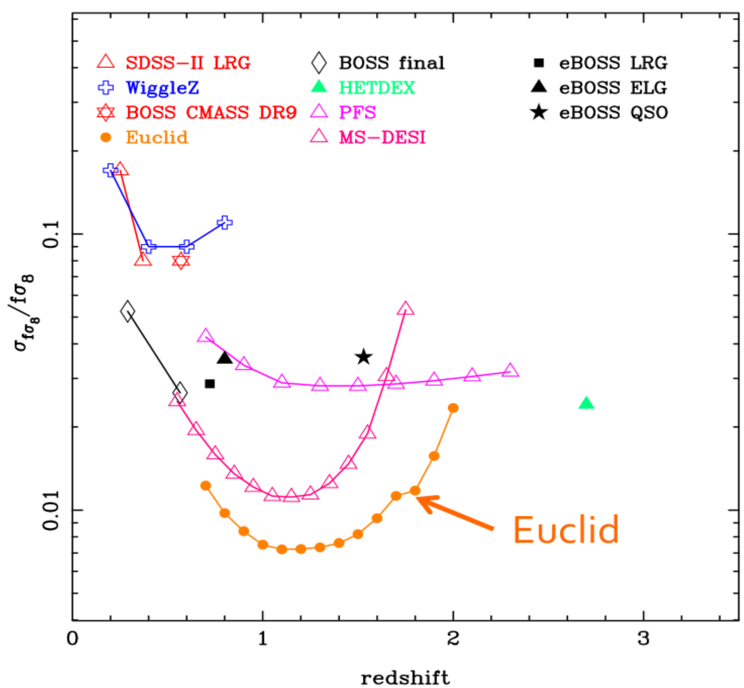


Clusters of galaxies:

WL masses

BAO: Euclid spectra

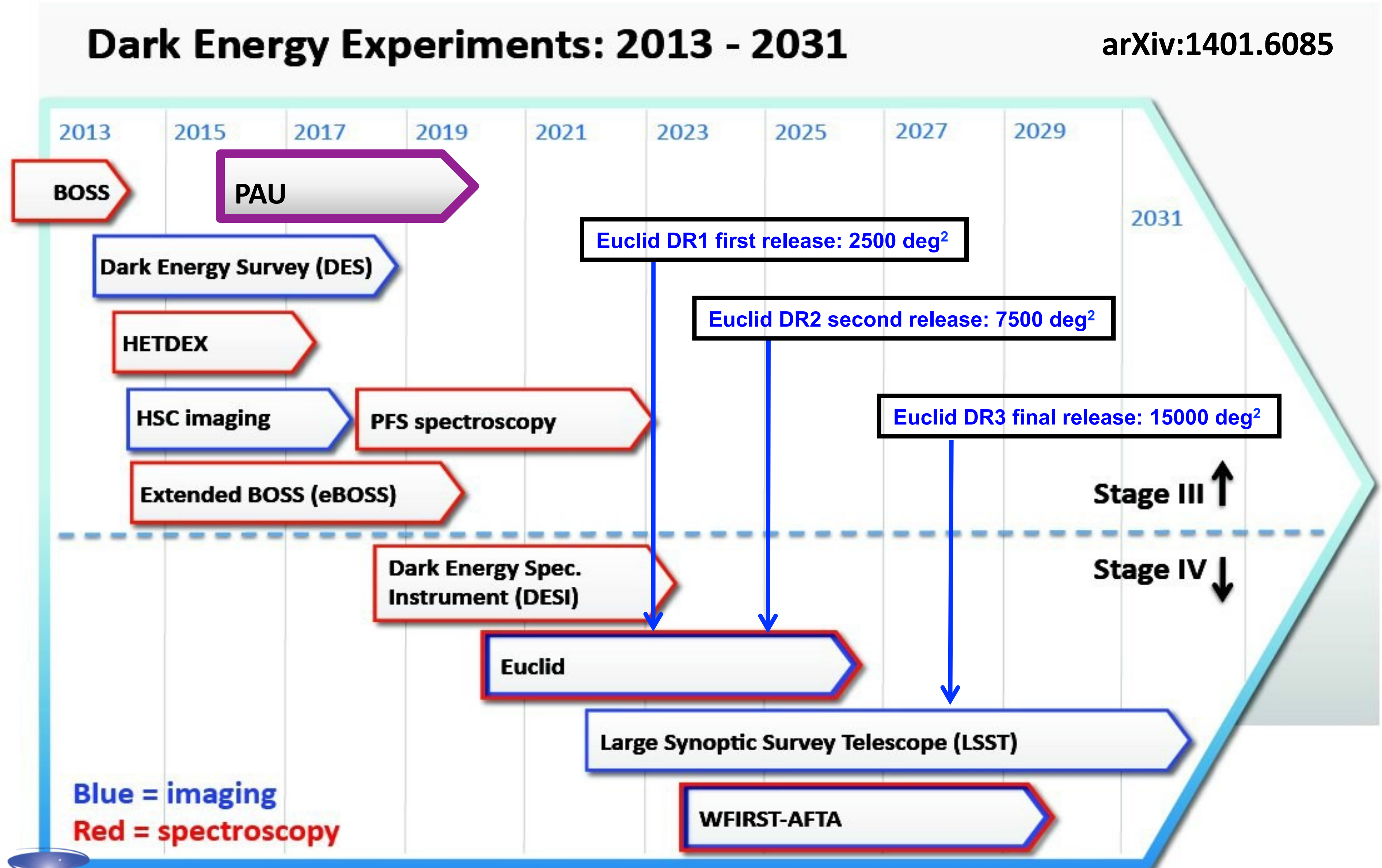




From Euclid SWG-GC group 2015

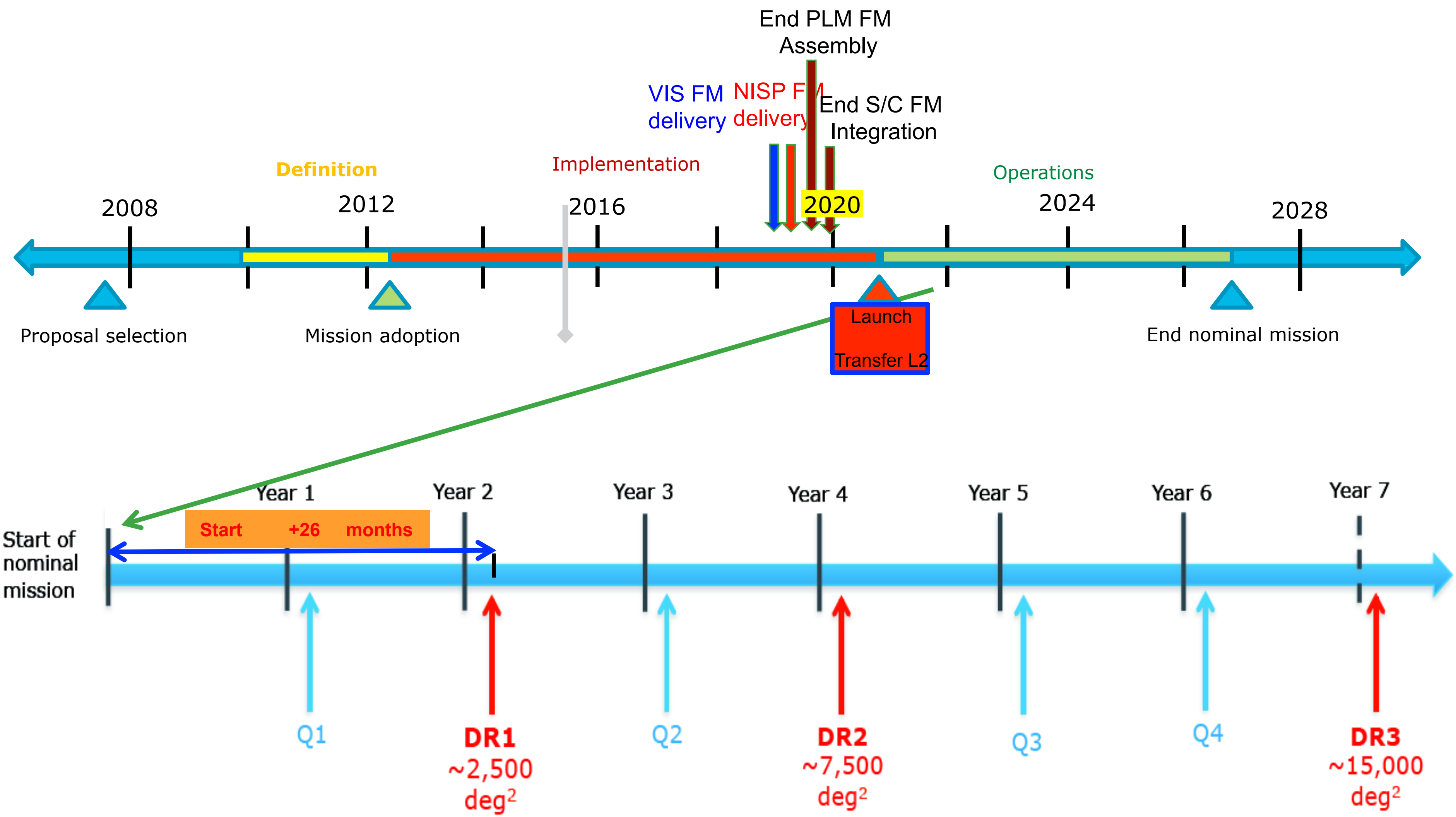
RSD: Euclid spectra

Euclid timelyness



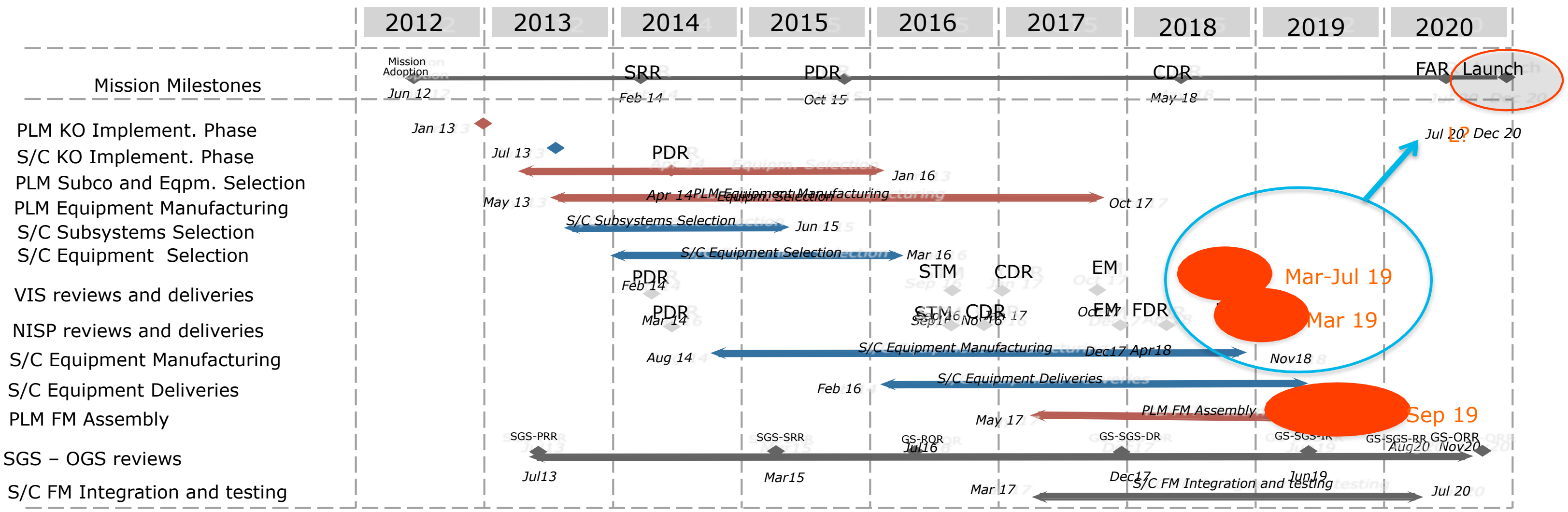
Summary

Mission Timeline and Data Releases



Science with Euclid will start in 2022 with Q1 and in 2023 with DR1

Euclid Scedule



ESA UNCLASSIFIED - For Official Use

euclid European Space Agency

Summary

- Euclid cosmology core program:
  - Use 5 cosmological probes, with at least 2 independent, and 3 power spectra
  - Perfect complementarity with Planck: probes and data, cosmic periods
  - Explore the Dark universe: DE, DM (neutrinos), MG, inflation, biasing, baryons
  - Explore the transition DM-to-DE-dominated universe period
  - Get the percent precision on w and the growth factor γ
  - Synergy with New Gen wide field surveys: LSST, WFIRST, e-ROSITA, SKA
- Euclid =12 billion sources, 35 million redshifts, 1.5 billion shapes/photo-z of galaxies;
  - A mine of images and spectra for the community for years;
  - A reservoir of targets for JWST, E-ELT, TMT, ALMA, VLT, MSE, 4MOST, MOONS,
  - A set of astronomical catalogues useful until 2040+
  - Best synery with 4MOST: photo-z, clusteriing-z, clusters, arcs/rings, cool stars
- Big challenges: data processing (100-300 Petabytes), cosmological simulations
- Launch 2020, start 2021: **2500 deg^2 public in 2023**, 7500 deg^2 in 2025, final 2027