Euclid National Meeting 2023

Introduction - Mission Status

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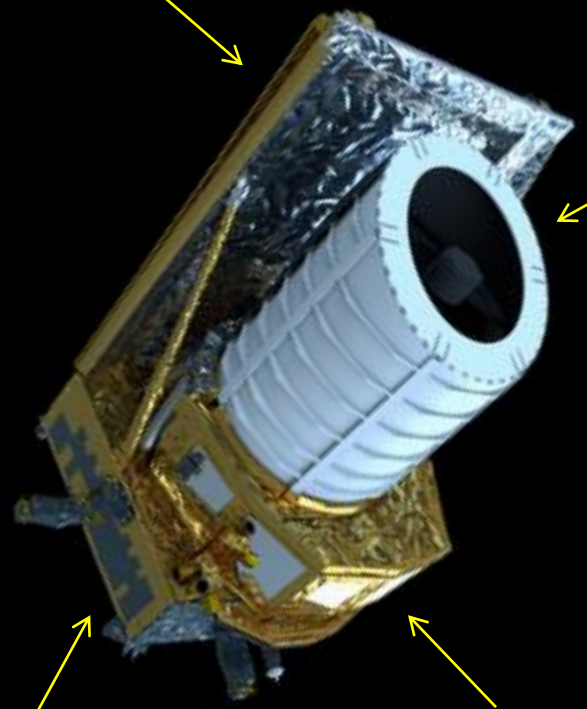
ESA *Euclid*
2008-2023+

ESA + Euclid Consortium
+ NASA + CSA + Japan + Industries

*Merging of **SPACE** (PI A. Cimatti) and **DUNE** (PI A. Refregier) Cosmic Vision proposals (2007) for M2 missions*

- **2008 – 2009**: Assessment Phase
- **2010 – 2011**: Definition Phase
- **2012**: Adoption by ESA
- **2015**: PDR → construction
- **2018**: CDR passed
- **2023**: launch (Space-X Falcon 9) 🤞



Euclid Project Status

Input to A.Cimatti for Euclid-Italia

Giuseppe D Racca, Euclid Project Manager

15 January 2023

Image Credit to Hubble UDF 2014: NASA, ESA, IPAC/Caltech, STScI, Arizona State University

Euclid System AIT (Assembly Integration and Testing) status

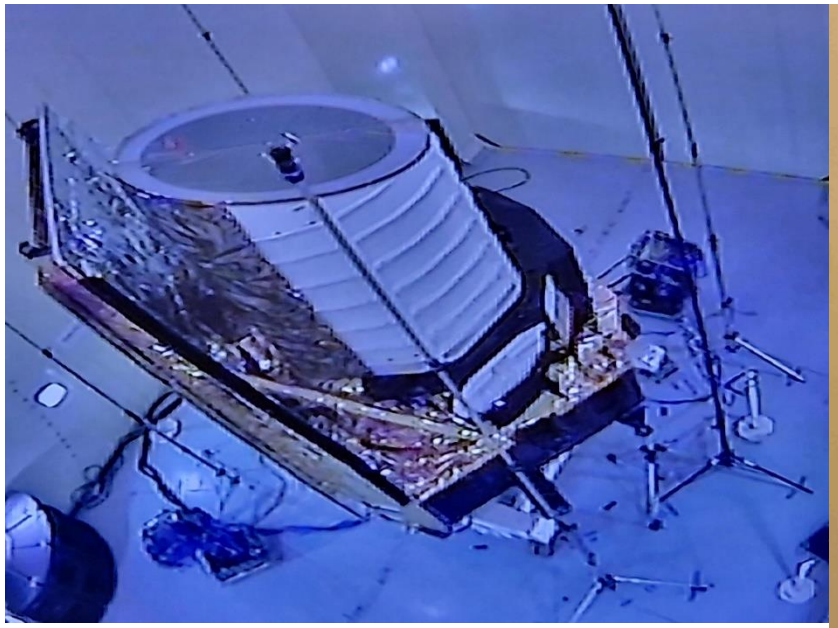
- **Avionics Model** (AVM)
  - All Engineering Model (EM), OBSW 2.2.4, MST+FDIR (Failure Detection Isolation and Recovery) tests ongoing, TVAC test preparation;
- **Structure Thermal Model** (STM) => all FM now, no SVM (Service Module) STM (Structure and Thermal Model) anymore;
- **Flight Model** (FM)
  - All FM equipments are delivered and integrated in the spacecraft;
  - Replacement of all micropropulsion pressure regulators, all working fine now, leak test successful.
  - SSH and E-PLM delivered, electrically and mechanically integrated, mated to the SVM, functional tests completed;
  - Conducted system EMC (ElectroMagnetic Compatibility) test successfully performed (CDPU issue uncovered);
  - System validation tests successfully performed with ESOC, ESAC and IOT (see also OGS report);
  - Telescope alignment test performed in air with M2M actuation (to be repeated after ETC);
  - OBSW 2.2.6 loaded and used for TBTV test;
  - TBTV test performed successfully in October. Main results:
    - All functional tests successful with minor NCRs under resolution. Thermal behaviour globally as expected;
    - One Micropropulsion thruster failed. It was replaced with a spare one. Root cause determined: flowsensor;
    - The instrument performance globally well, see later slide;
  - Mechanical vibration test : Sine and Acoustic successfully completed;
  - Finally radiated EMC test and RCS (Reaction Control Subsystem) leak test by the end of February
  - Possible adapter fit-check in March if available, or later in Florida. Shipment by boat in mid April

Cannes: Euclid roll in and out the TV chamber

Nov 2022: a month of testing the fully integrated spacecraft and subsystems in conditions of space

Back in the Cannes' clean room

Euclid in the Acoustic Chamber



Testing whether Euclid can withstand the effects of acoustic noise on top of its launcher

Mission Level activities progress

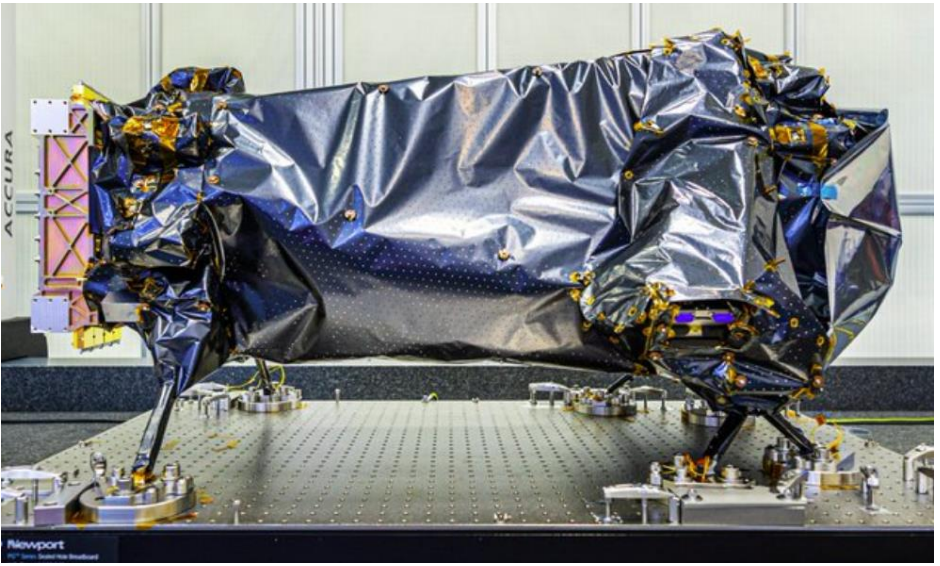
- **Test Bench facility** to characterise the spare dichroic WFE(λ) chromatic aberration over full pupil to extreme level (1 nm λ-res, 55 Noll Zernike);
  Many difficulties encountered during the development, operational end of Jan '23

- **Ice decontamination,** a test performed in ESTEC produced some results a bit puzzling, under investigation by ESA and EC;
  More work by the Calibration WG is necessary to define operational procedures;

- **Mission Commissioning**, including instrument commissioning, telescope refocusing and Performance Verification phase in progress;

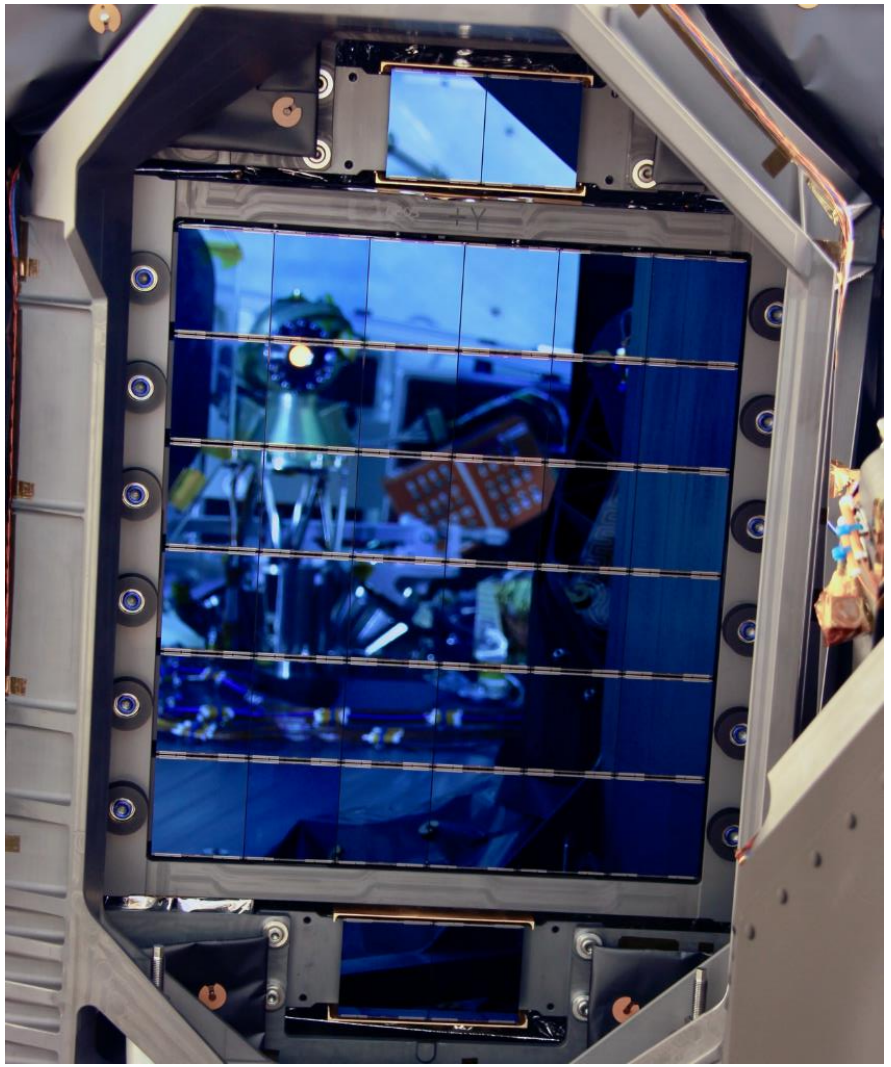
- **Mission Verification activity:** MRD VCD (Verification Control Doc) requires substantial input by EC, concerning calibration (CalCD-A, CalCD-B, CalF);

NISP Instrument

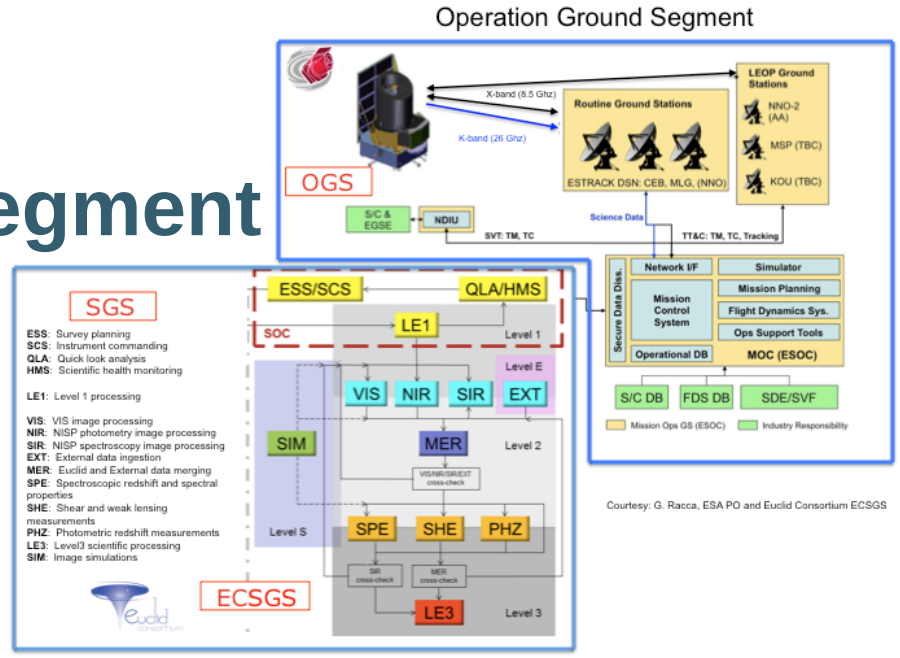


See next talks!

VIS Instrument



Ground Segment

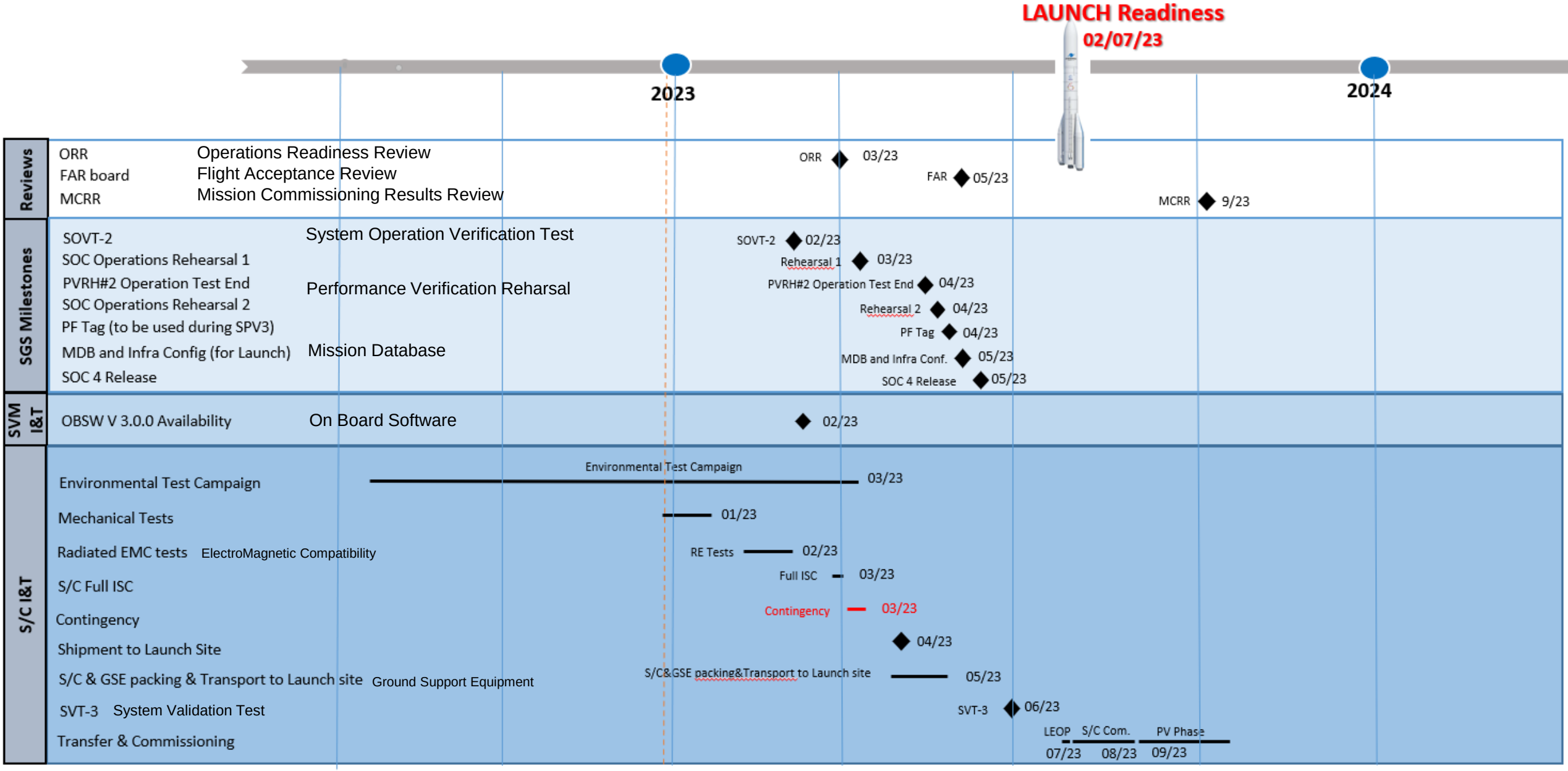


Launcher Status

- Soyuz from CSG, equipped with a Fregat MT upper stage, was the baseline launcher for Euclid;
- Ariane6, equipped with two solid boosters (Ariane62), was the back-up launcher;
- Before the war, Arianespace confirmed a 3-months Launch Period from 1st April 2023 with Soyuz;
- Ariane 6 maiden launch is to take place in the second half of 2023 ➔ Euclid launch on A62 will likely be at the end of 2024 or 2025 (or even later), despite earlier commitment by AE in 24Q2;
- AE studied the compatibility with Japan's H-III for a possible launch in 1H24. The study showed many issues to solve, but no clear showstopper. No launch commitment, expected mid-end 2024;
- ESA contracted SpaceX to run a feasibility to launch with Falcon9. The intense 3-months study concluded that a launcher is compatible and launch is feasible in 3Q23, target 1st July 2023;
- All the Arianespace activities have been stopped in June for Soyuz and in Nov for A62;

- **Positive results, following the IPC and Council decision to allow to procure a launcher outside Member States allowed to issue an RFQ to SpaceX on October 25th, evaluated and negotiated the offer in Dec 2023;**
- **A Preliminary ATP for a launch period of Jul-Sep 2023 was given to SpaceX**
- **The Launch slot (1 month) will be decided on 1st Feb 23 within the launch period**

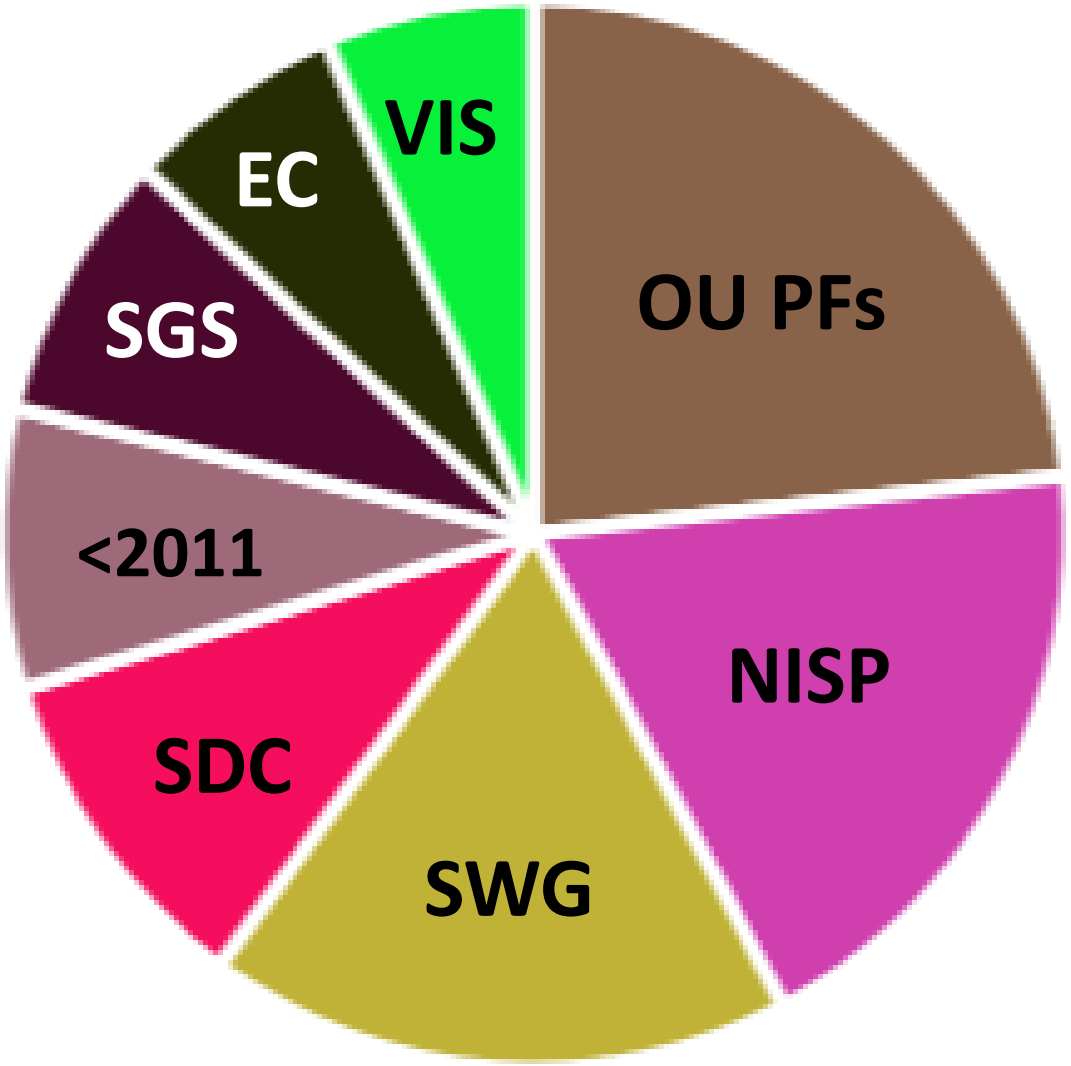
Remaining Activities (based on V 12.3 + GSRR)



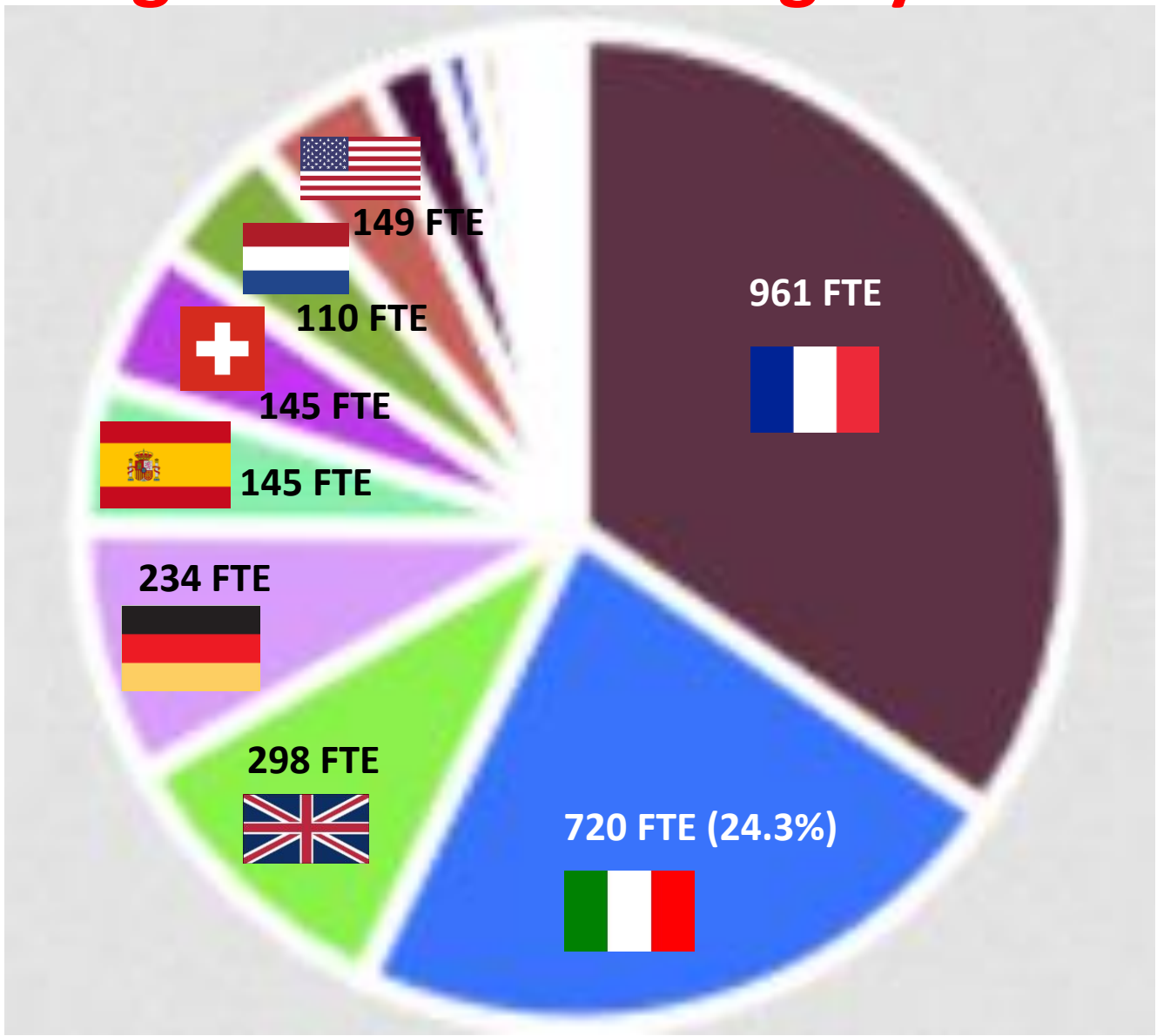
Euclid Consortium - Some Statistics

(as of January 2023)

Integrated FTE by activity (whole EC)



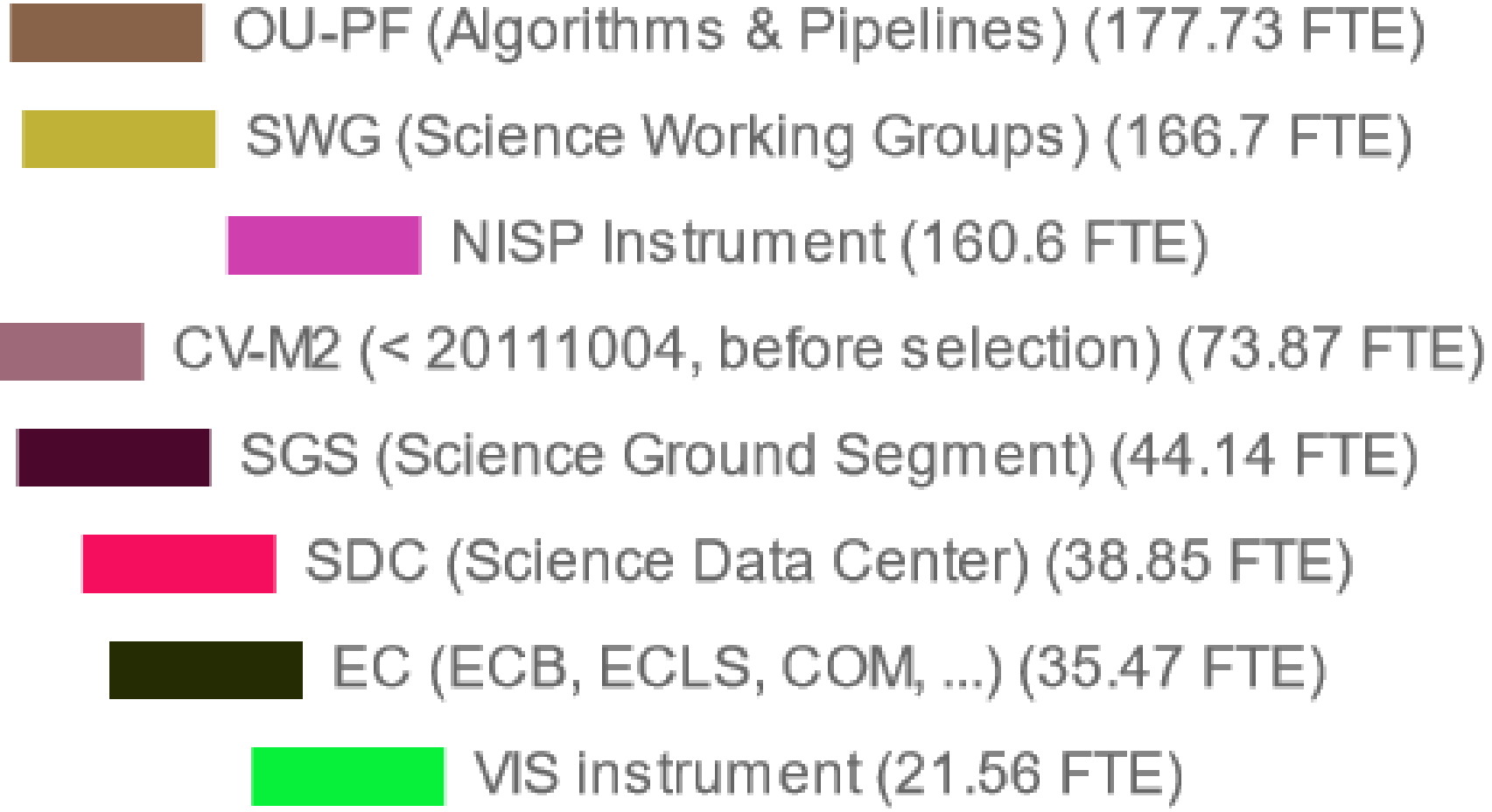
Integrated FTE - Sharing by country



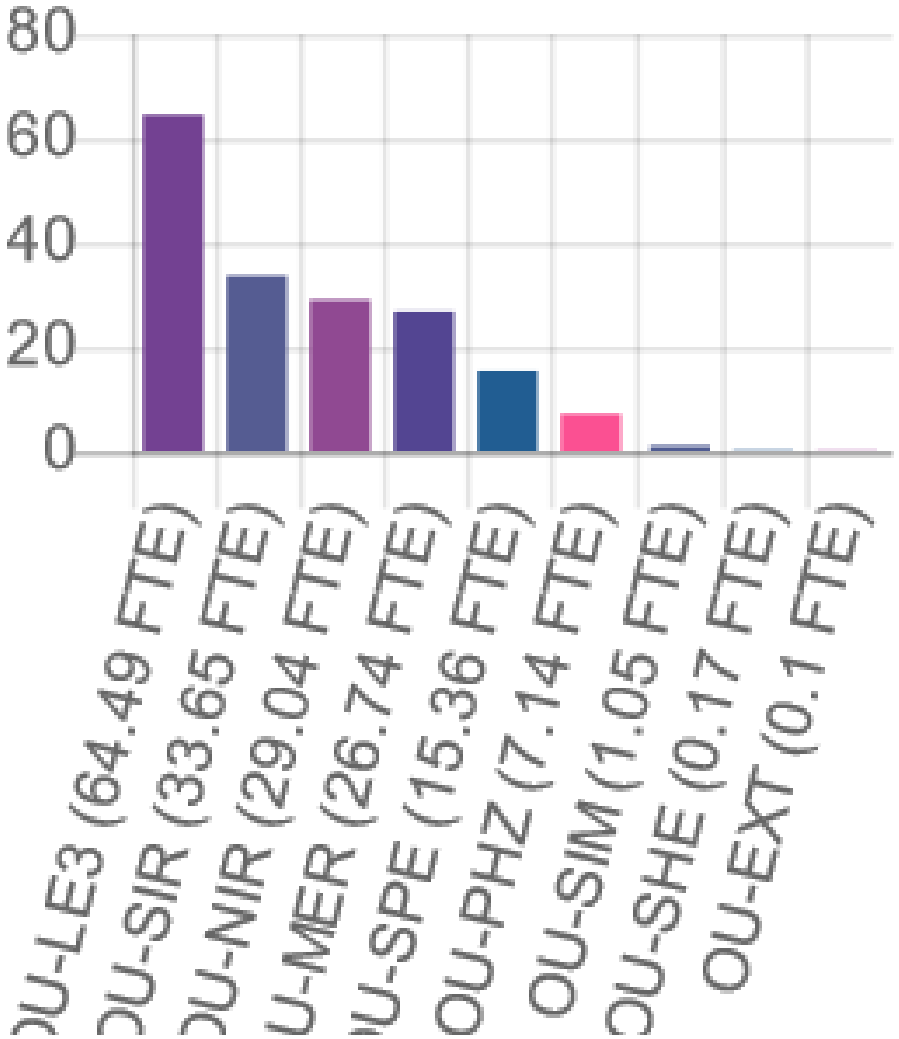
Total 2963 FTE
(14/01/2023)

345 FTE in 2018

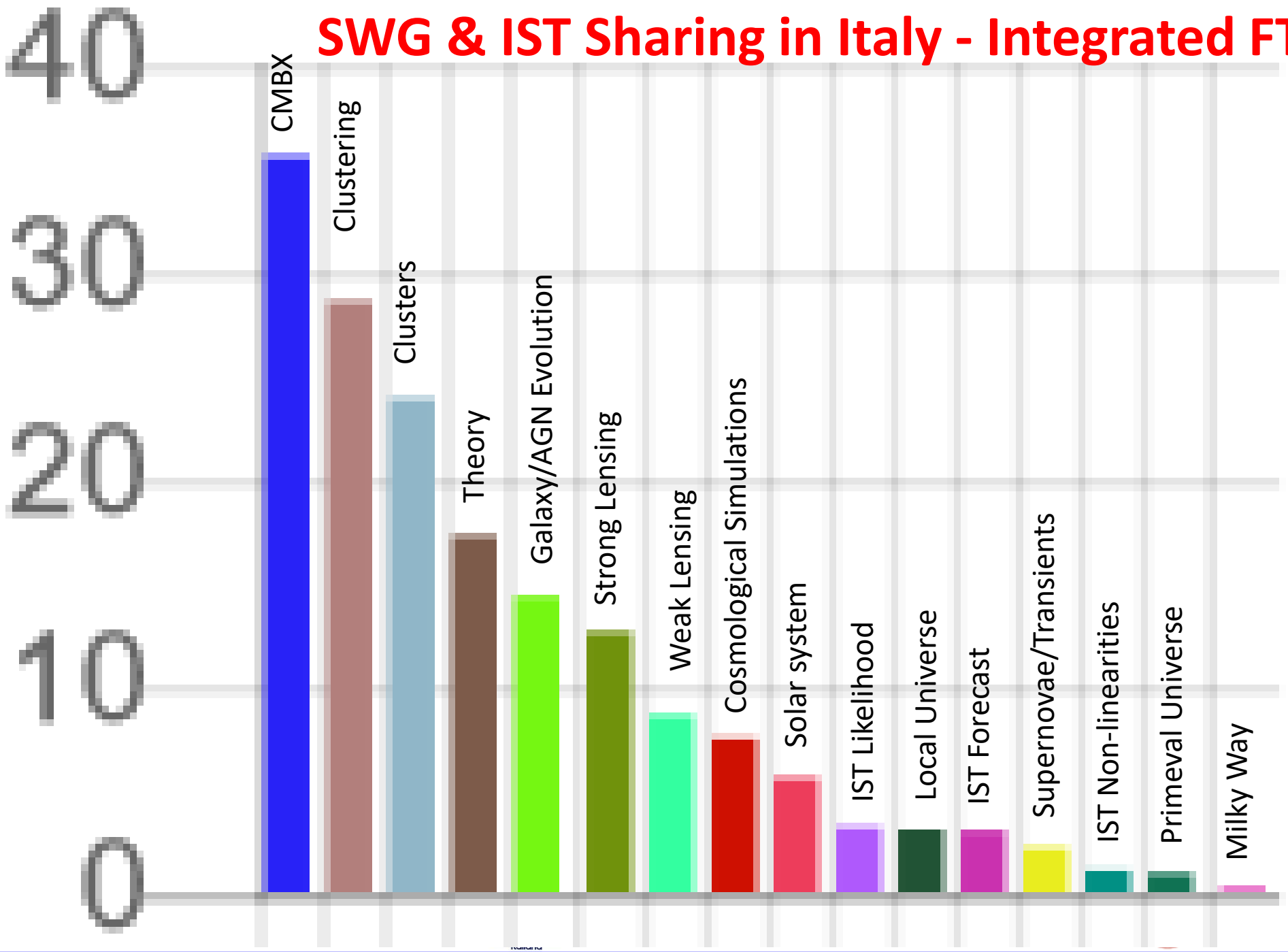
Sharing in Italy - Integrated FTE



OU Sharing in Italy - Integrated FTE



SWG & IST Sharing in Italy - Integrated FTE



Was It Worth It?

Yes

Despite the forced marriage with DUNE and the brutal descoping of spectroscopy:

- Italy is now the second partner of Euclid
- Growth of national community (science and technology).
- Diffuse involvement of space industries
- Large network of collaborations (in EC and in Italy)
- Development of new research fields
- National and European funds (ASI, PRIN, EU, …)
- Career opportunities for young scientists
- Role of universities in education and training