

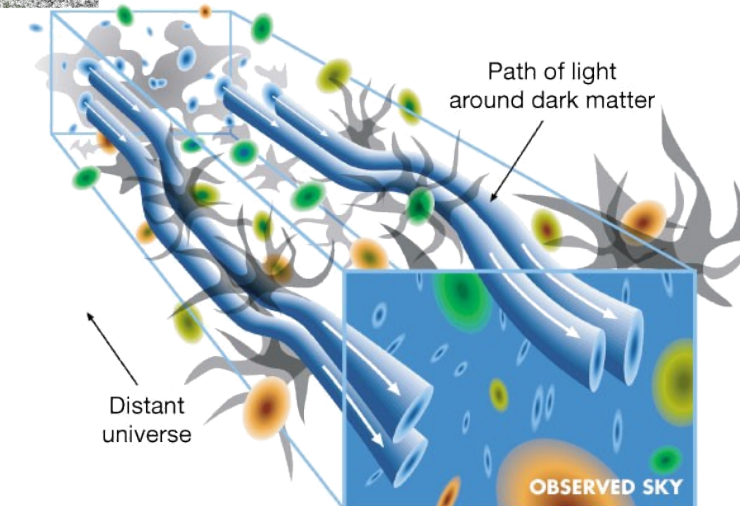
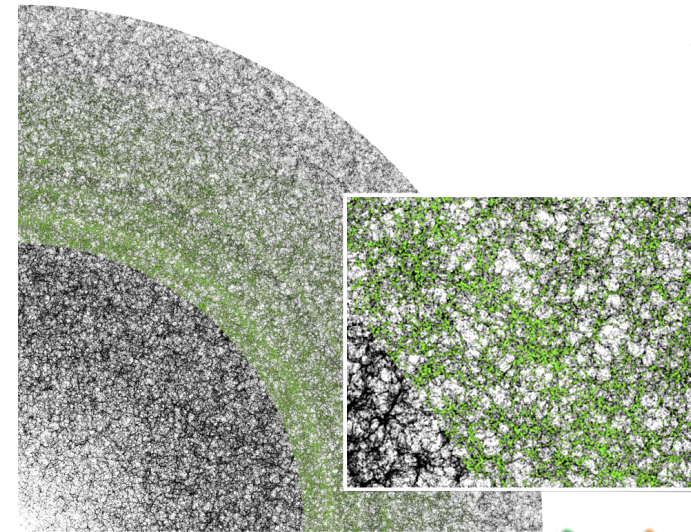
Euclid @UniMI

Consiglio Sezione INFN Milano
- 8 Luglio 2024

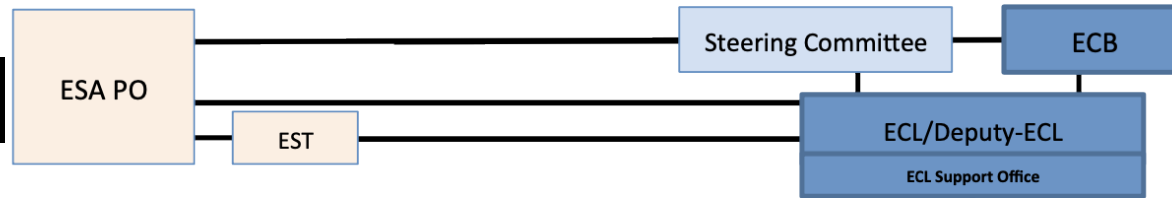


Euclid in a nutshell

- **ESA M2** space mission in the framework of the Cosmic Vision program
- **Launched July 1st 2023**. Duration **>6 years**
- 1.2m telescope with two instruments: Visible Imager (**VIS**) and Near Infrared Spectrometer and Photometer (**NISP**)
- Wide survey (**14.000 deg²**) and deep survey (**50 deg²** in 3 different fields)
- Measurements of over **2 billion galaxy images** and around **30 million galaxy spectra** out to $z > 2$
- Primary probes: **Galaxy Clustering** and **Weak Lensing**
- Additional probes: **CMB cross-correlation, clusters, strong lensing + legacy science**
- Main scientific objectives: **Dark Energy, Dark Matter, and General Relativity**



Euclid @UniMI



DO NOT circulate until the Steering Committee endorse it (Dec 2019)

Davide Maino

Co-lead of the SDC-IT, SGS-PO, Science Coordinator

Luigi Guzzo

Core Science Coordinator, **GC-SWG** Coordinator, Chair of the ECPG Science (ECEB)

Ben Granett (INAF)

Co-lead of the "E2E" WP of the GC-SWG, lead developer of the PF LE3-ID-VMSP

Maria Archidiacono

Co-lead of the "Dark Matter and Particle Cosmology" WP of the TH-SWG

Emanuele Castorina

GC-SWG & TH-SWG

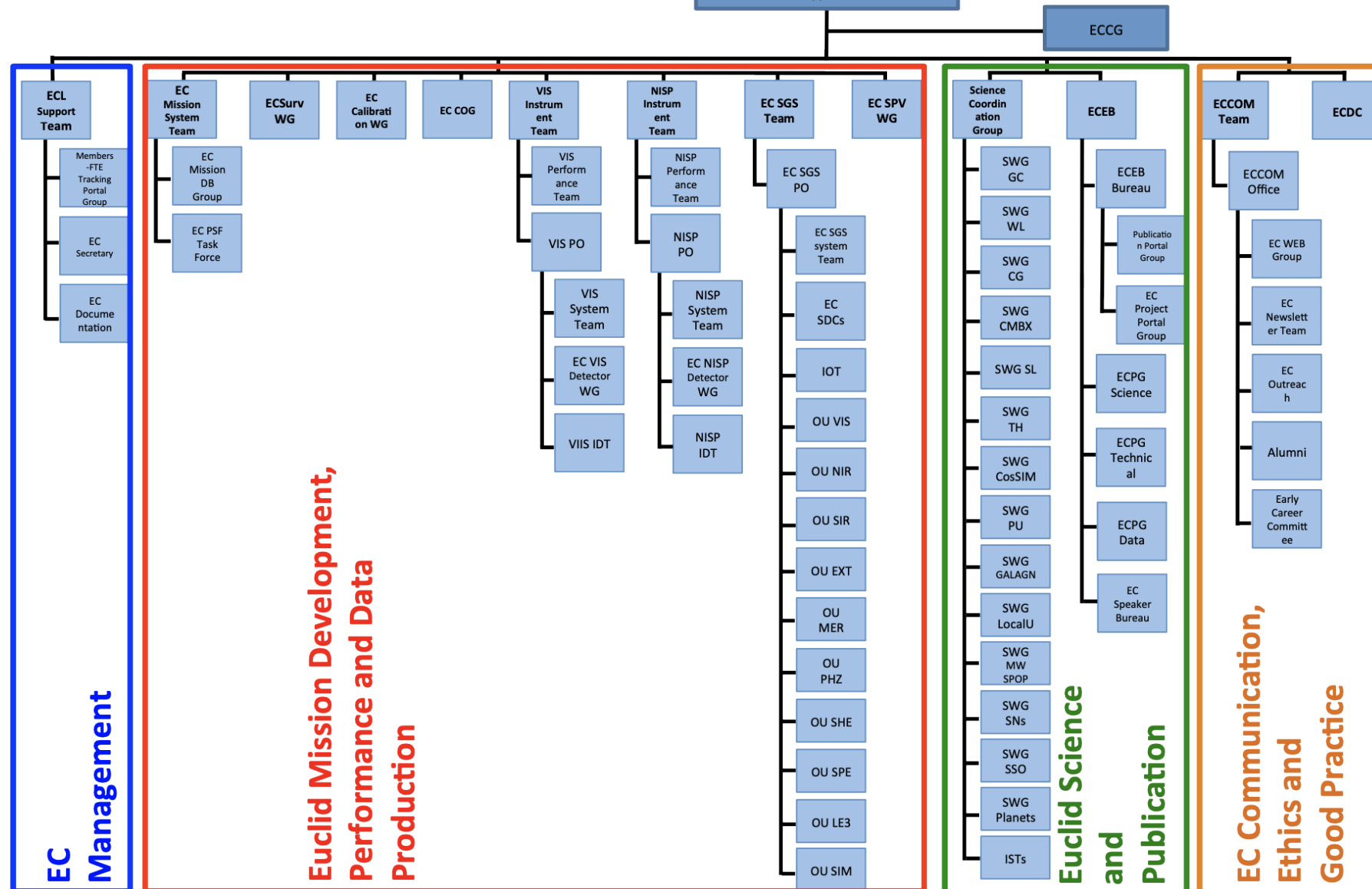
Carmelita Carbone (INAF)

Co-lead of the "Likelihood" WP of the GC-SWG, and of the "CMBX simulations" WP of CMBX-SWG

Marina Cagliari

Matilde Barberi Squarotti (PhD student)

GC-SWG



EC Management

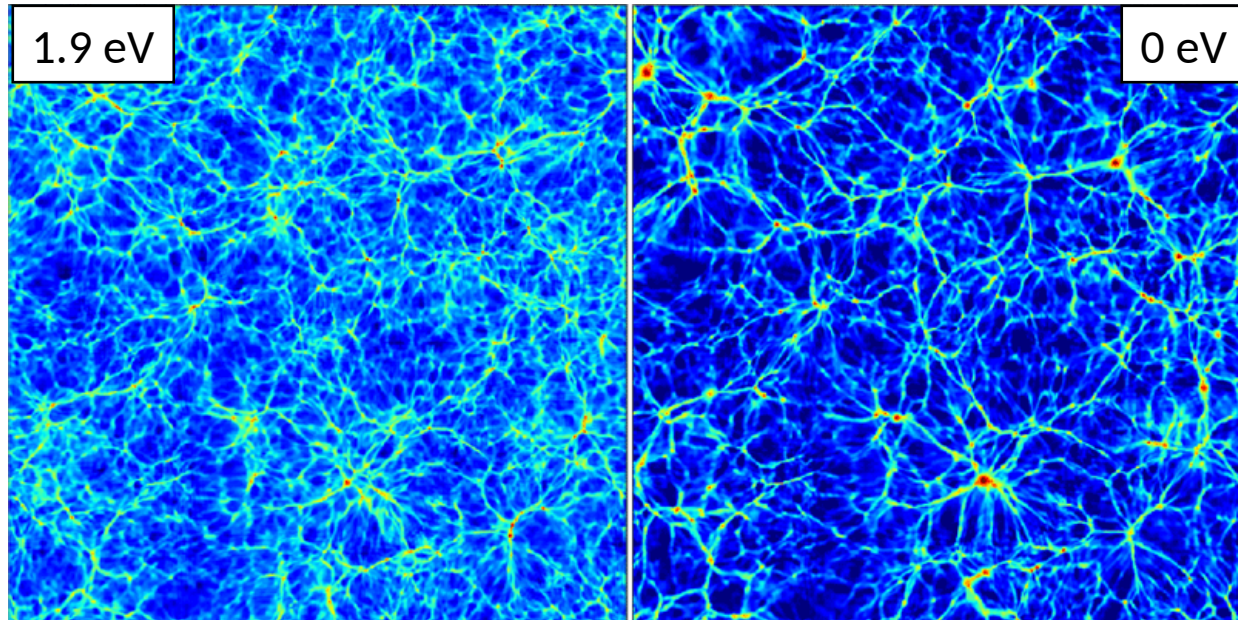
Euclid Mission Development, Performance and Data Production

Euclid Science and Publication

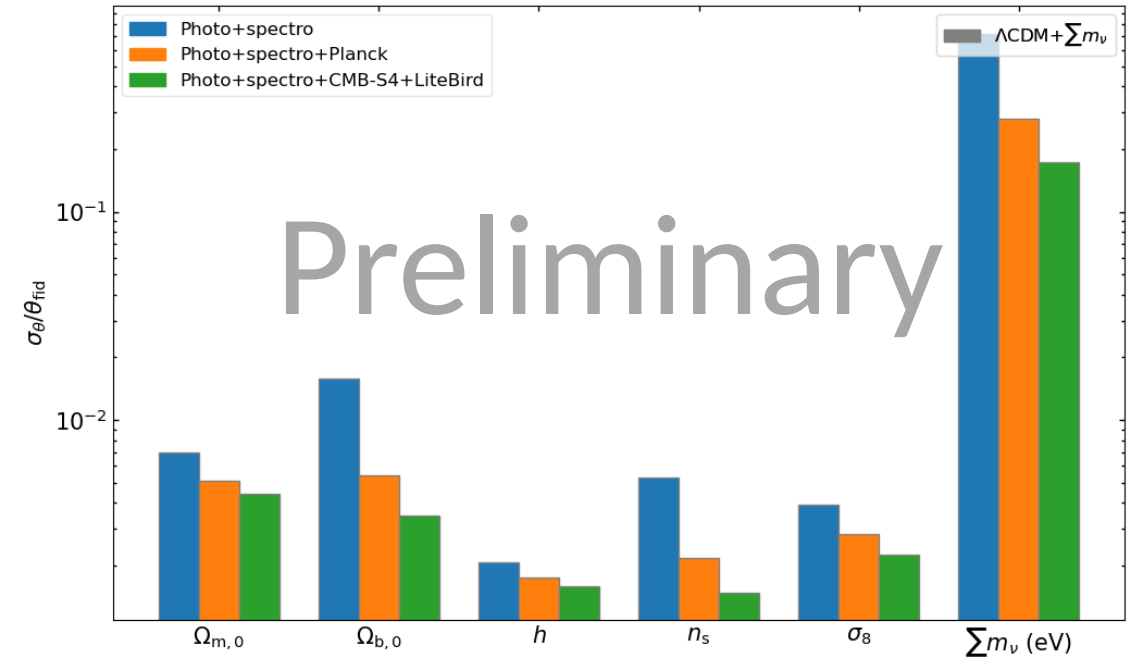
EC Communication, Ethics and Good Practice

Euclid and “particle cosmology” @UniMI

Carbone - DEMNUni suite of n-body simulations in neutrino/
dark energy cosmologies



Neutrino forecast (WP3 of the TH-SWG, led by
Maria Archidiacono and Julien Lesgourgues)



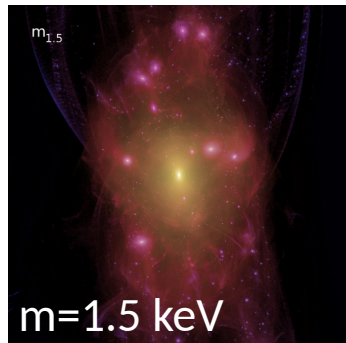
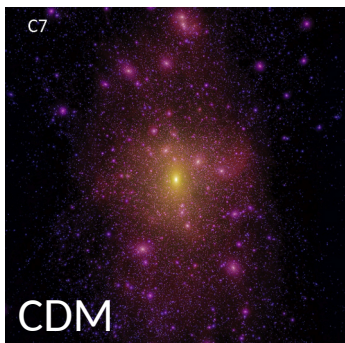
| | Λ CDM + $\sum m_\nu$ | | | | | |
|---|------------------------------|----------------|-----------|-----------|------------|--------------------|
| | $\Omega_{m,0}$ | $\Omega_{b,0}$ | h | n_s | σ_8 | $\sum m_\nu$ (meV) |
| Euclid-only | | | | | | |
| WL+GC _{ph} +XC _{ph} +GC _{sp} | 0.0021865 | 0.00077348 | 0.001396 | 0.0050909 | 0.0031656 | 43.128 |
| Euclid + CMB | | | | | | |
| Euclid + Planck | 0.0015981 | 0.00026652 | 0.0011844 | 0.0021014 | 0.0022841 | 16.876 |
| Euclid + CMB-S4 + LiteBird | 0.0013903 | 0.00017134 | 0.0010748 | 0.0014338 | 0.001824 | 10.365 |

Euclid and "particle cosmology" @UniMI

KeV sterile neutrinos

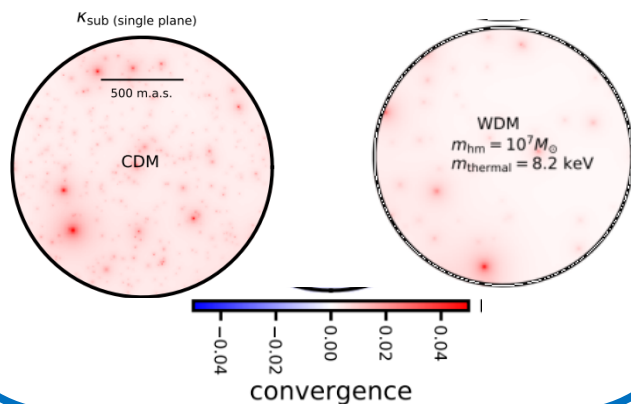
N-body simulations

Lovell+ 2014



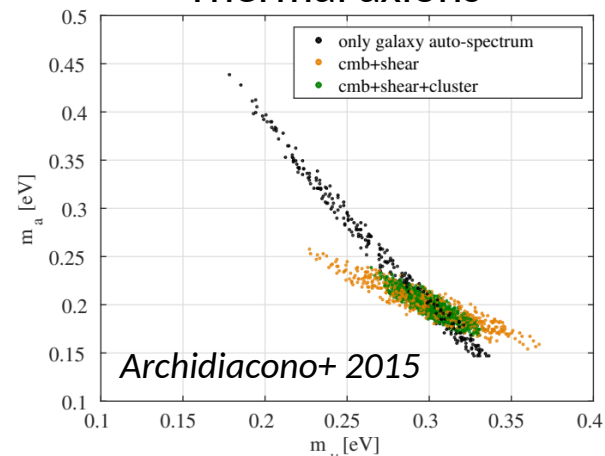
Strong gravitational lensing

Gilman+ 2019

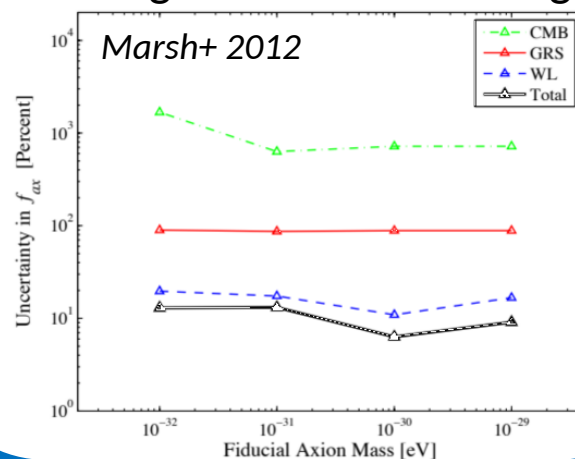


Axions

Thermal axions

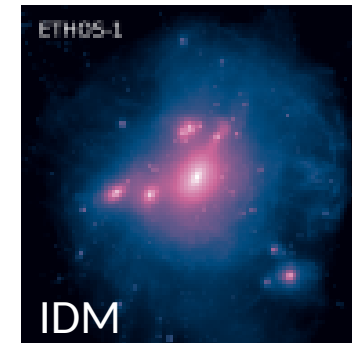
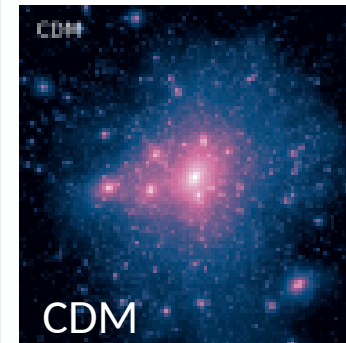


Ultra-light axions from strings

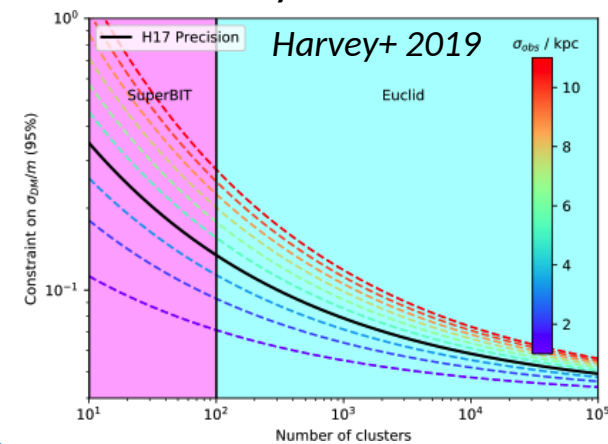


Self-interacting dark matter

N-body simulations *Vogelsberger+ 2016*

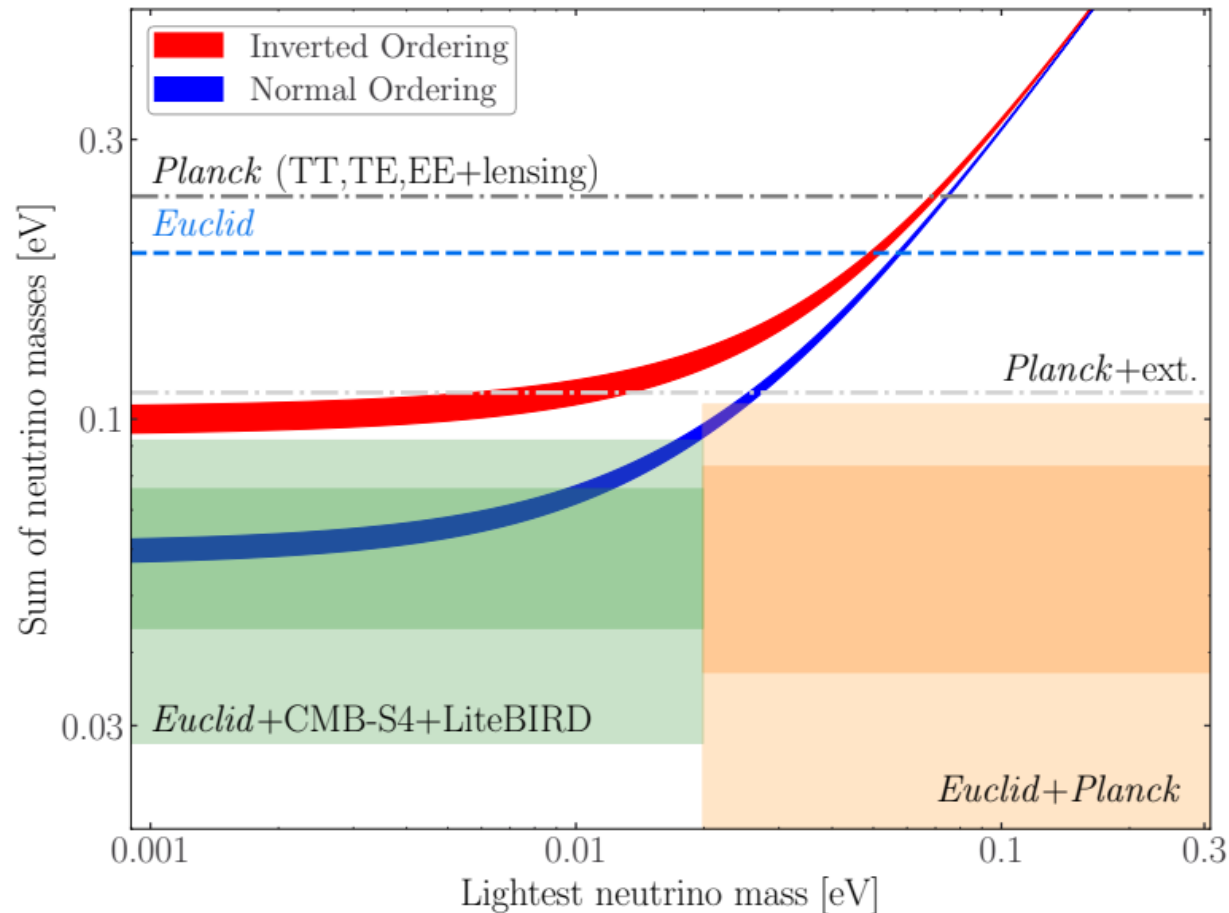


Galaxy clusters



Sensitivity to neutrino parameters

Euclid Collaboration: M. Archidiacono et al., arXiv:2405.06047



- Euclid in combination with upcoming CMB surveys can achieve a 4σ detection of Σm_ν , even if $\Sigma m_\nu = 0.058$ eV
- Cosmology is not directly sensitive to the neutrino mass ordering, like JUNO, however, if $\Sigma m_\nu = 0.058$ eV, then Euclid in combination with future CMB surveys can exclude IH at about 2σ



Anagrafica

Richiesta fondi

- D.Maino (50%), L.Guzzo (80%), M.Archidiacono (20%)
- Matilde Barberi Squarotti (PhD - TBD)

- 2k (+ 2k sj) per missioni 2025
 - Interazione con gli altri nodi della sigla Euclid-INFN
 - Euclid Collaboration meeting
 - SWG meetings
- (1k sj) sostituzione PC per obsolescenza