



SAPIENZA
UNIVERSITÀ DI ROMA

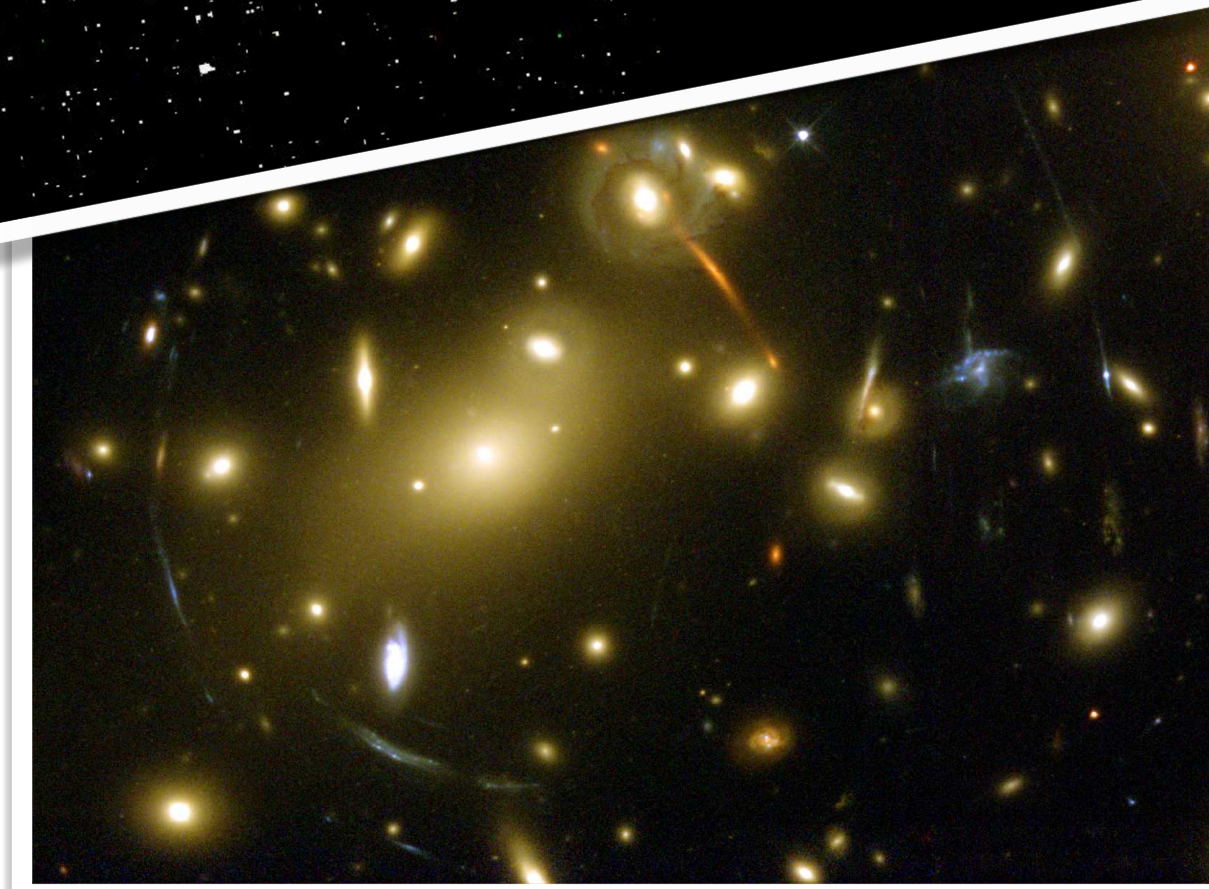
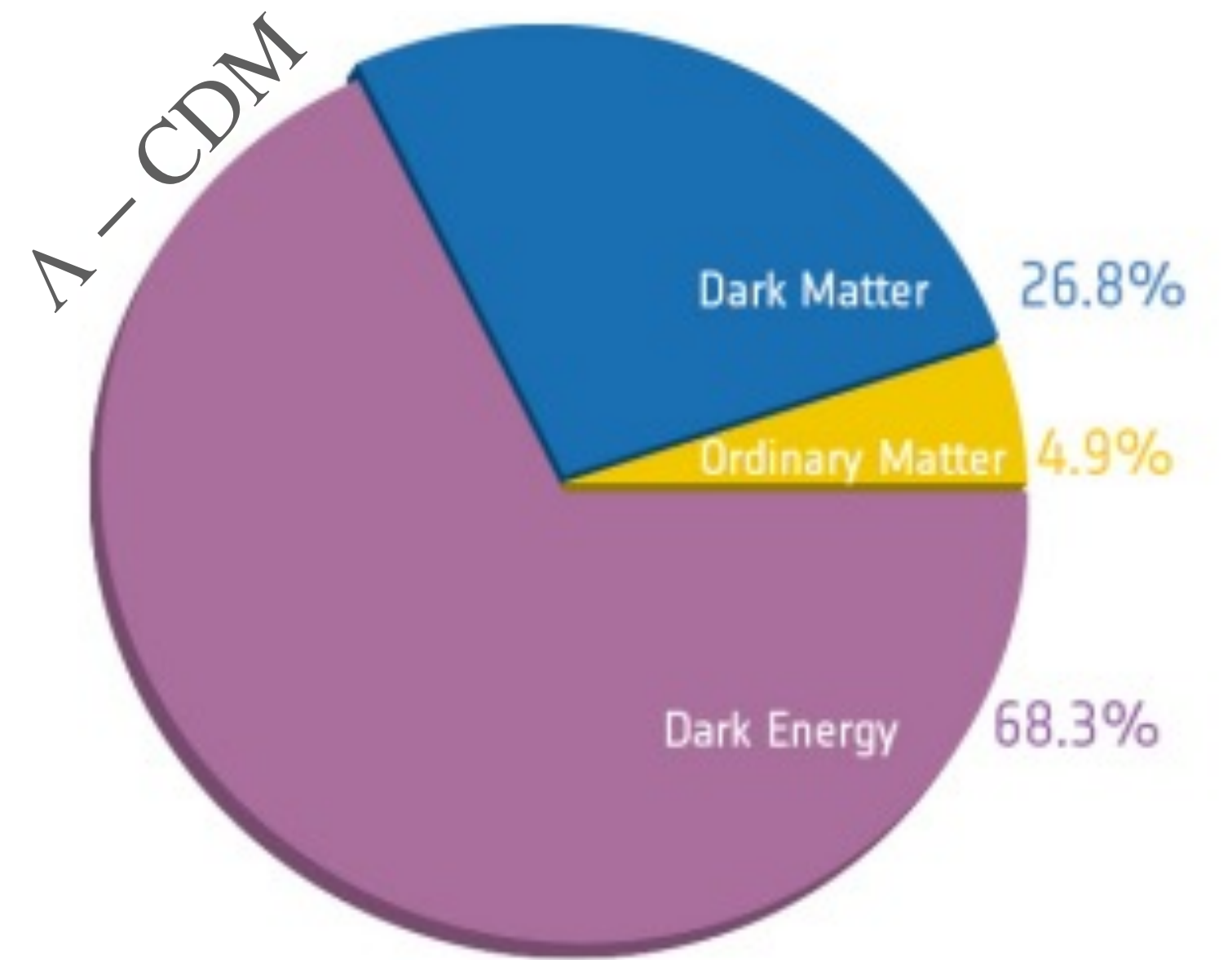
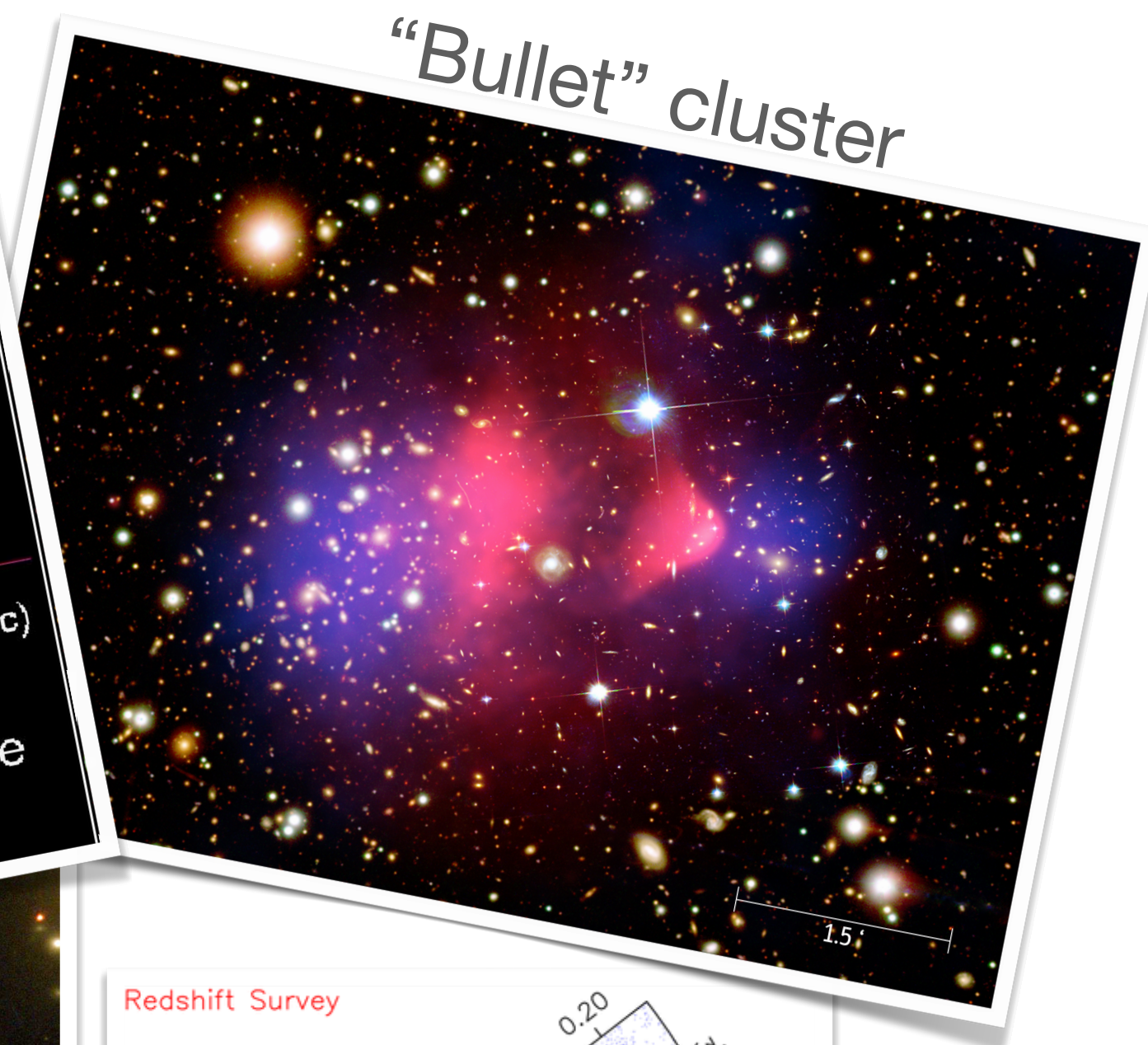
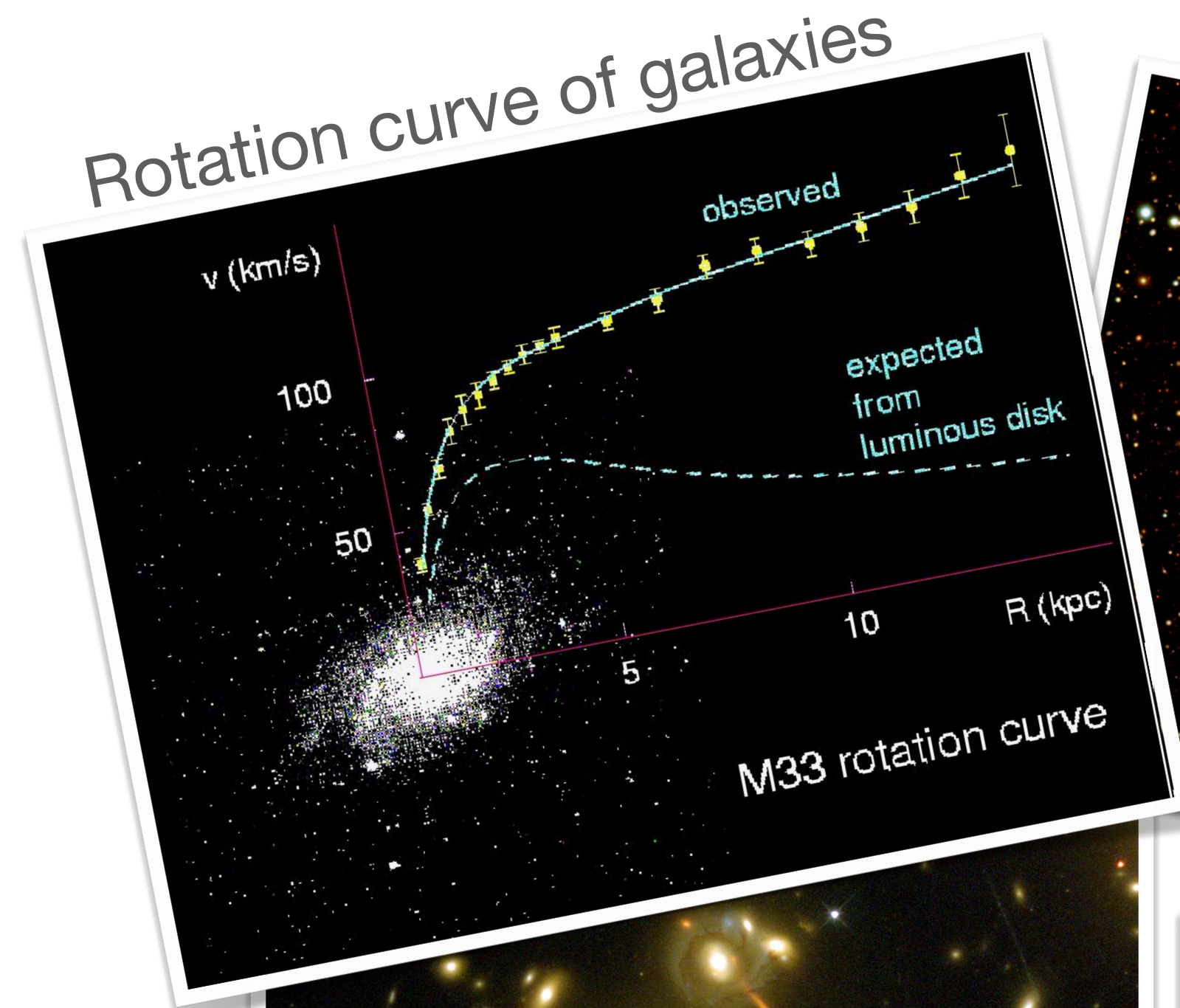


Superconducting Technologies for Dark Matter

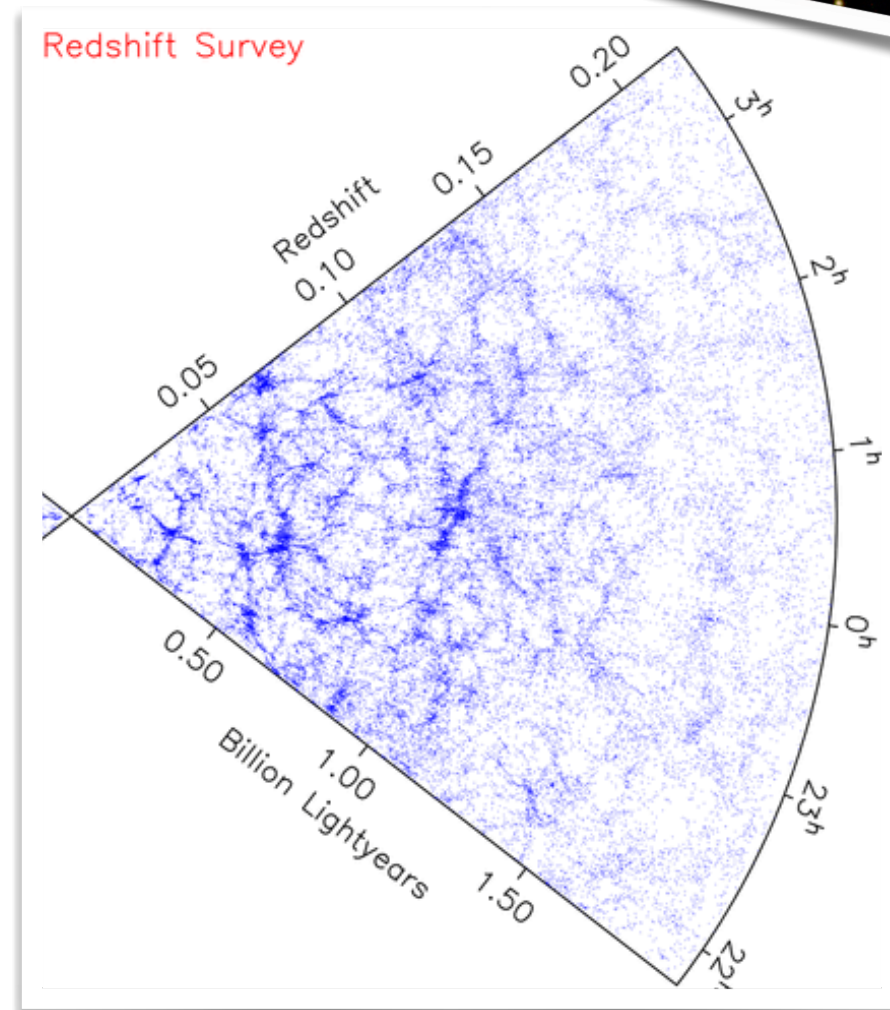
Sapienza - Physics Department
Dipartimento di Eccellenza 2023-2027

Marco Vignati, 11 May 2026, Roma - Centro Congressi di Ateneo

Dark Matter evidence



Gravitational lensing

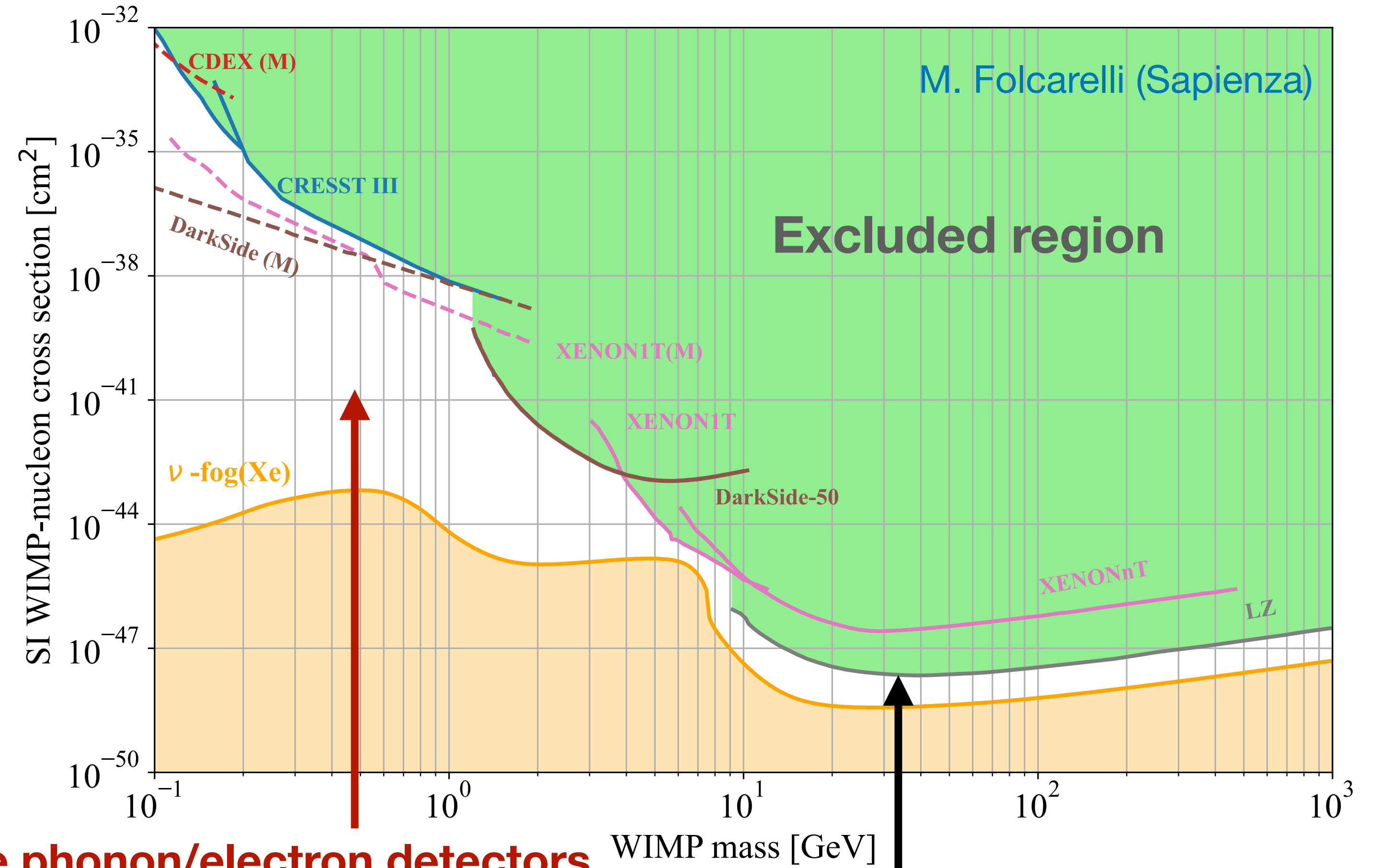
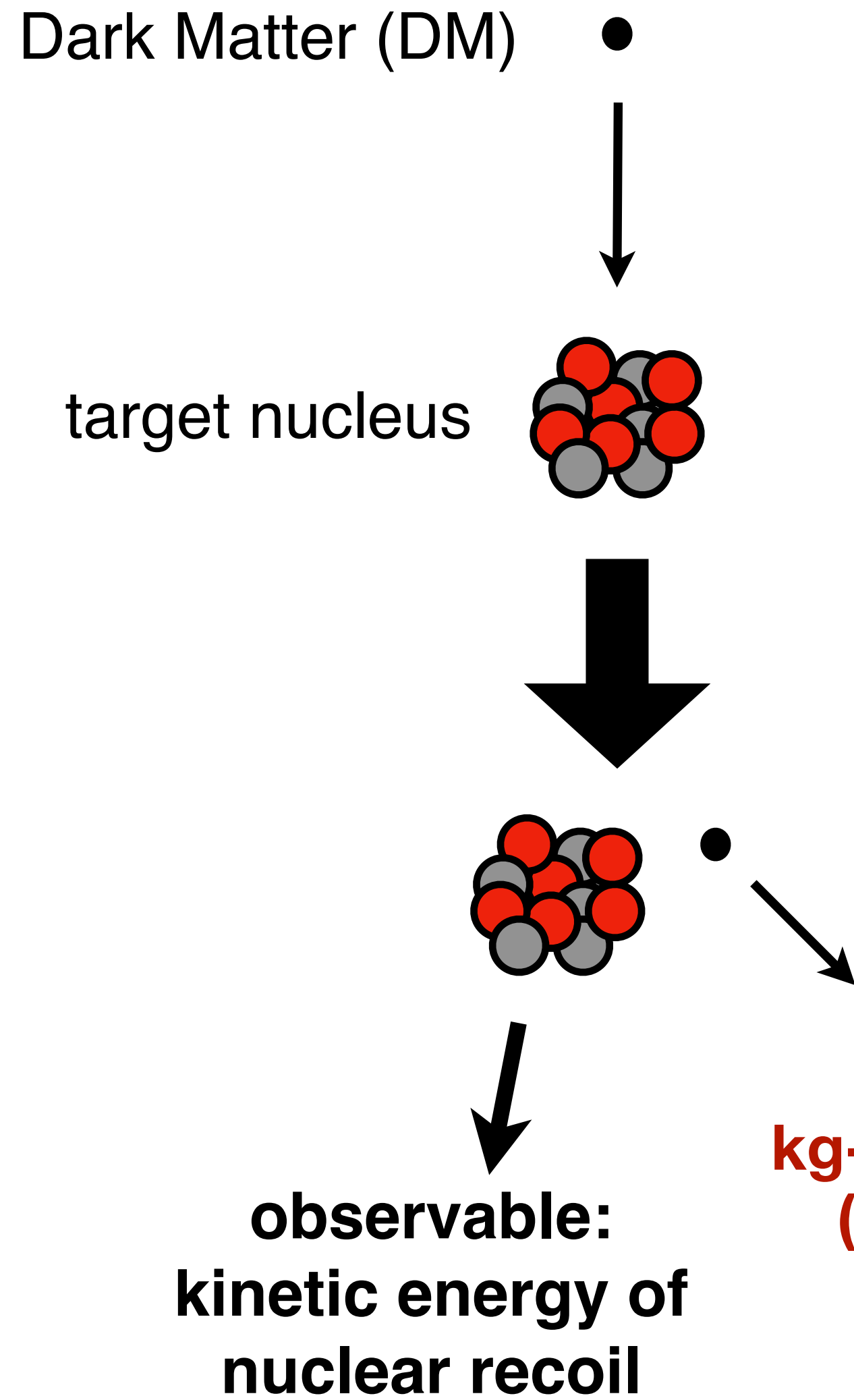


Large scale structures

What is the Dark Matter made of?

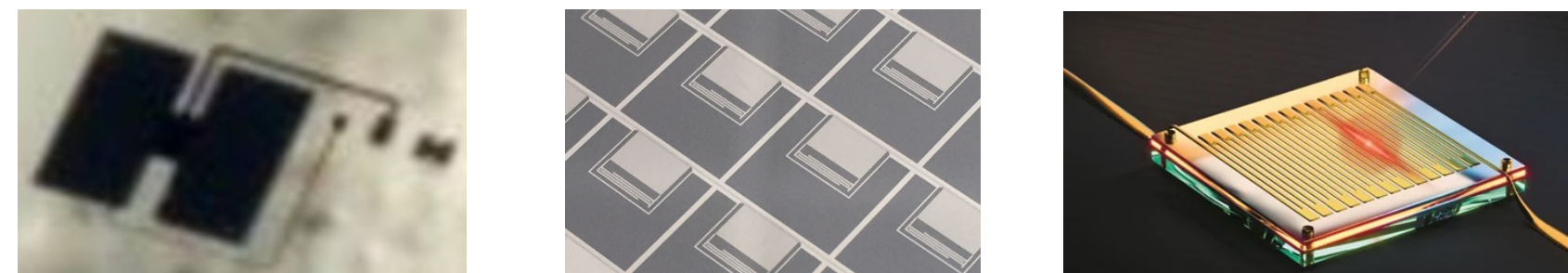
- primordial black holes?
- keV/c^2 - TeV/c^2 WIMP-like particles?
- $\mu\text{eV}/c^2$ - eV/c^2 axion-like waves?

State of the art of WIMP search

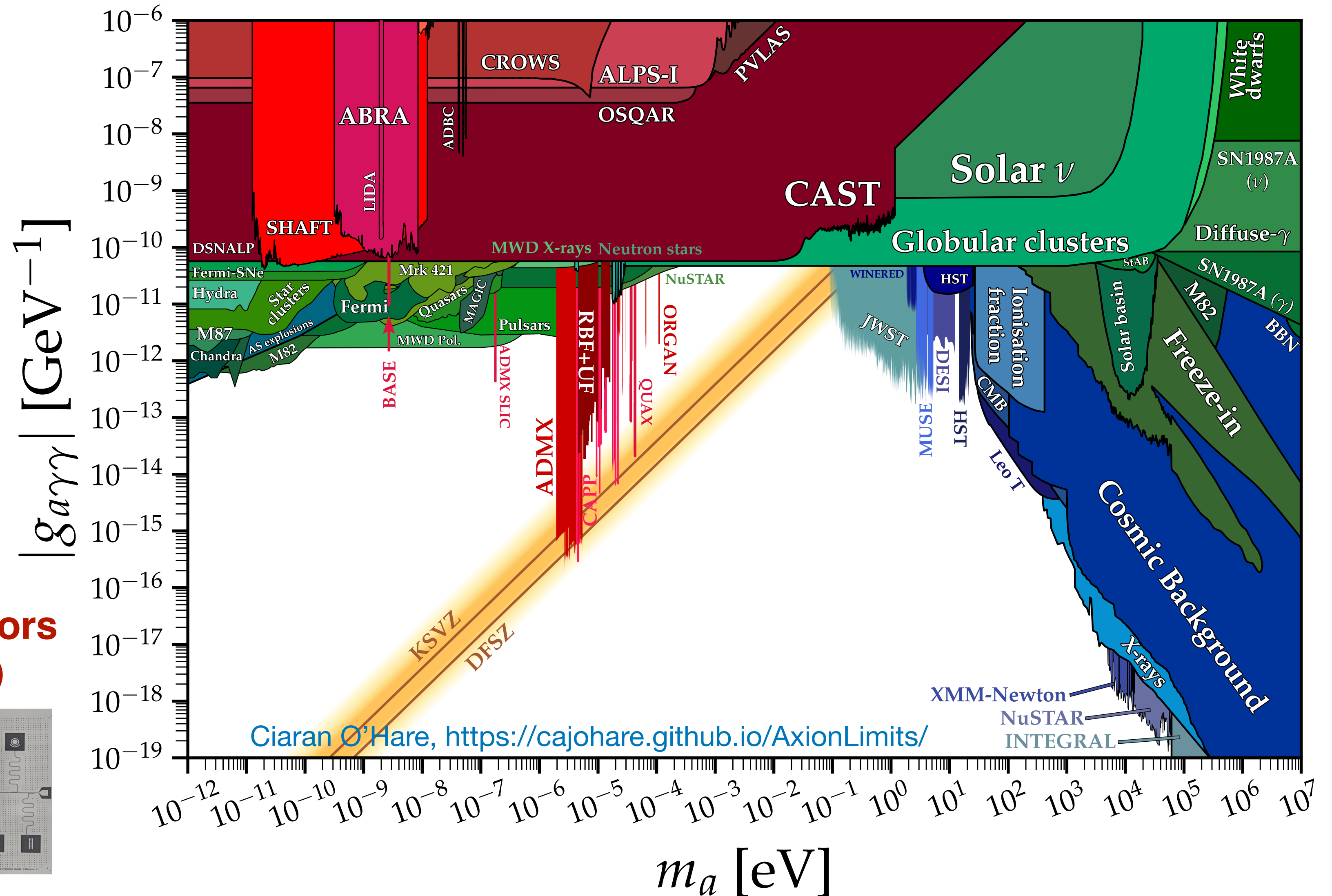
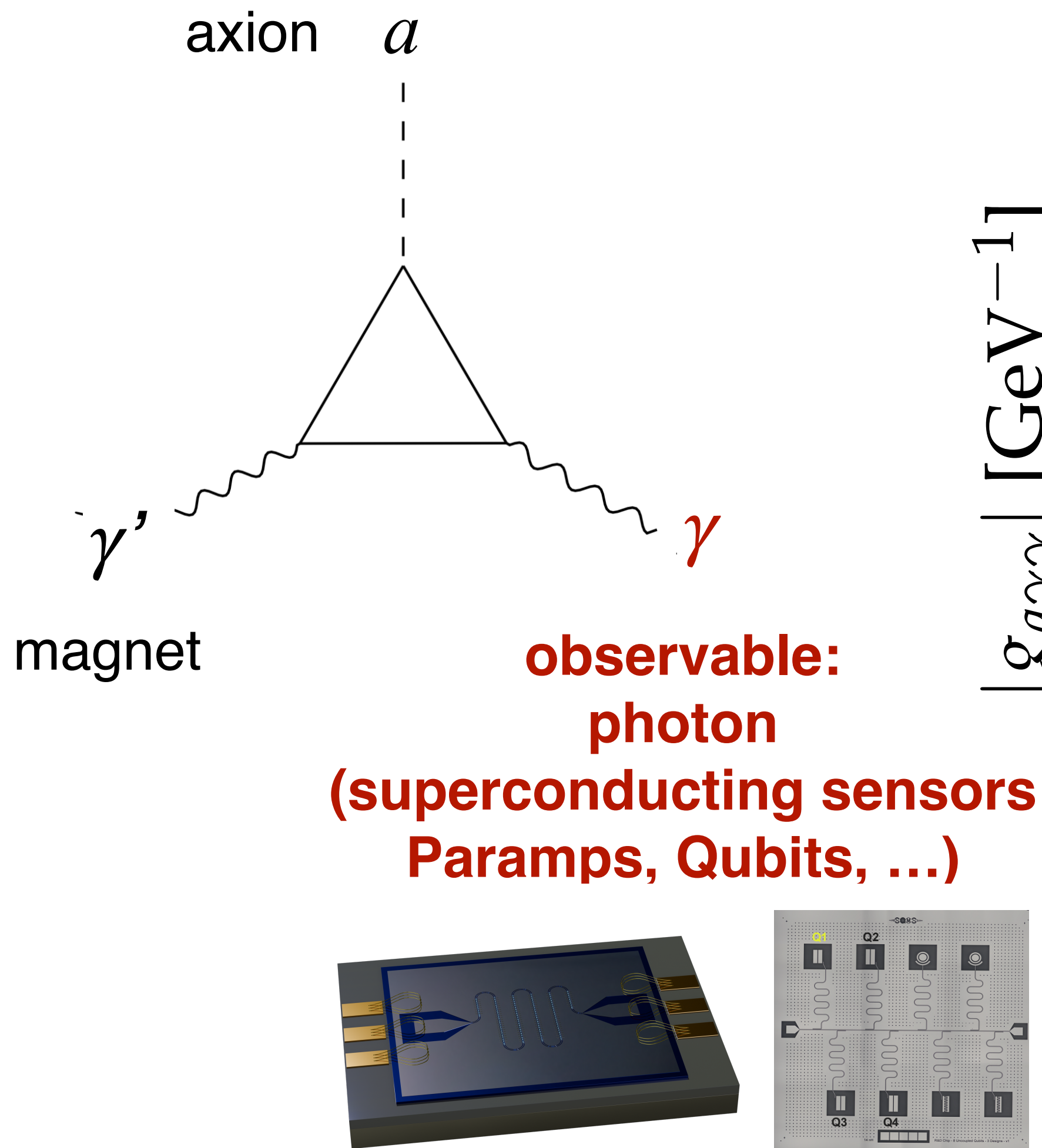


kg-scale solid-state phonon/electron detectors
(superconducting detectors: TES, KIDs, ...)

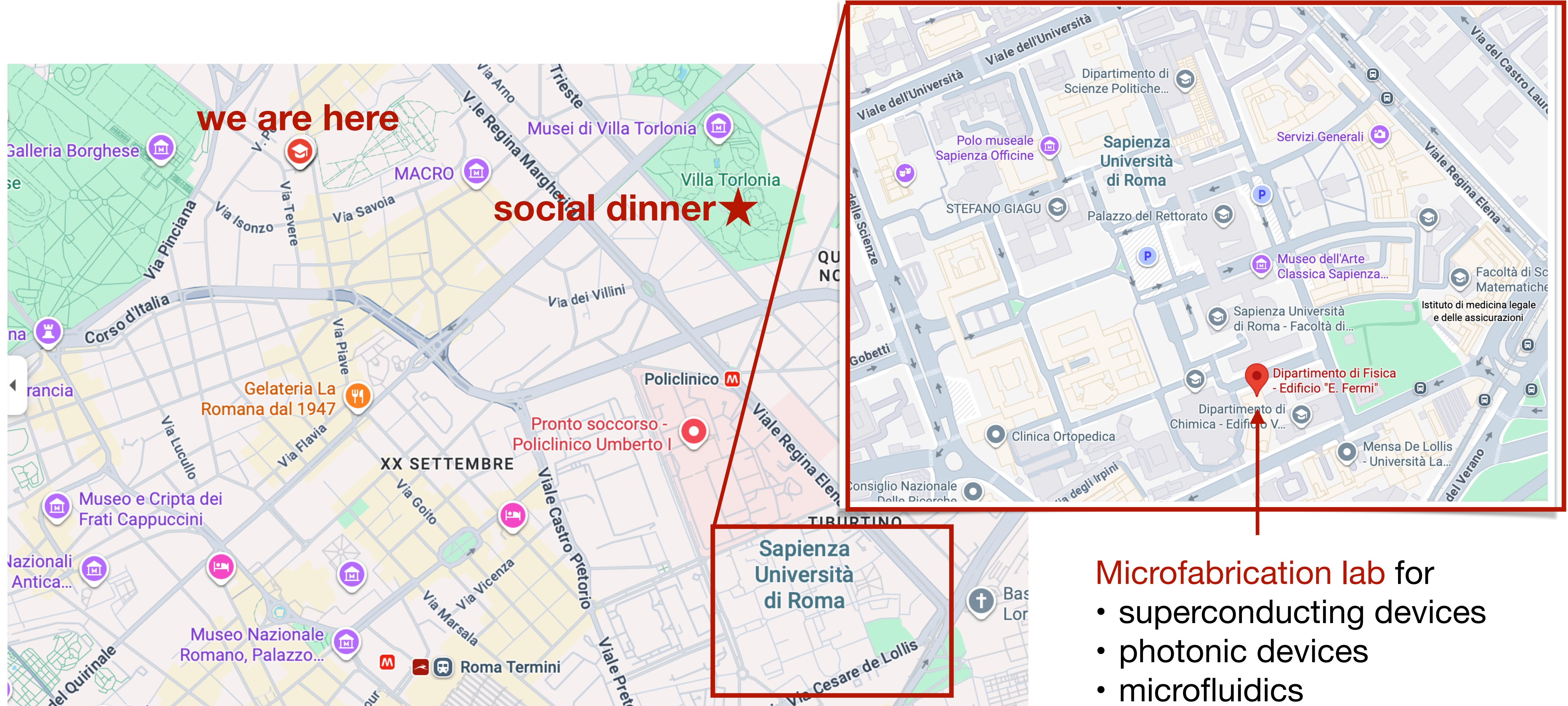
Multi-ton liquid scintillators



State of the art of Axion search

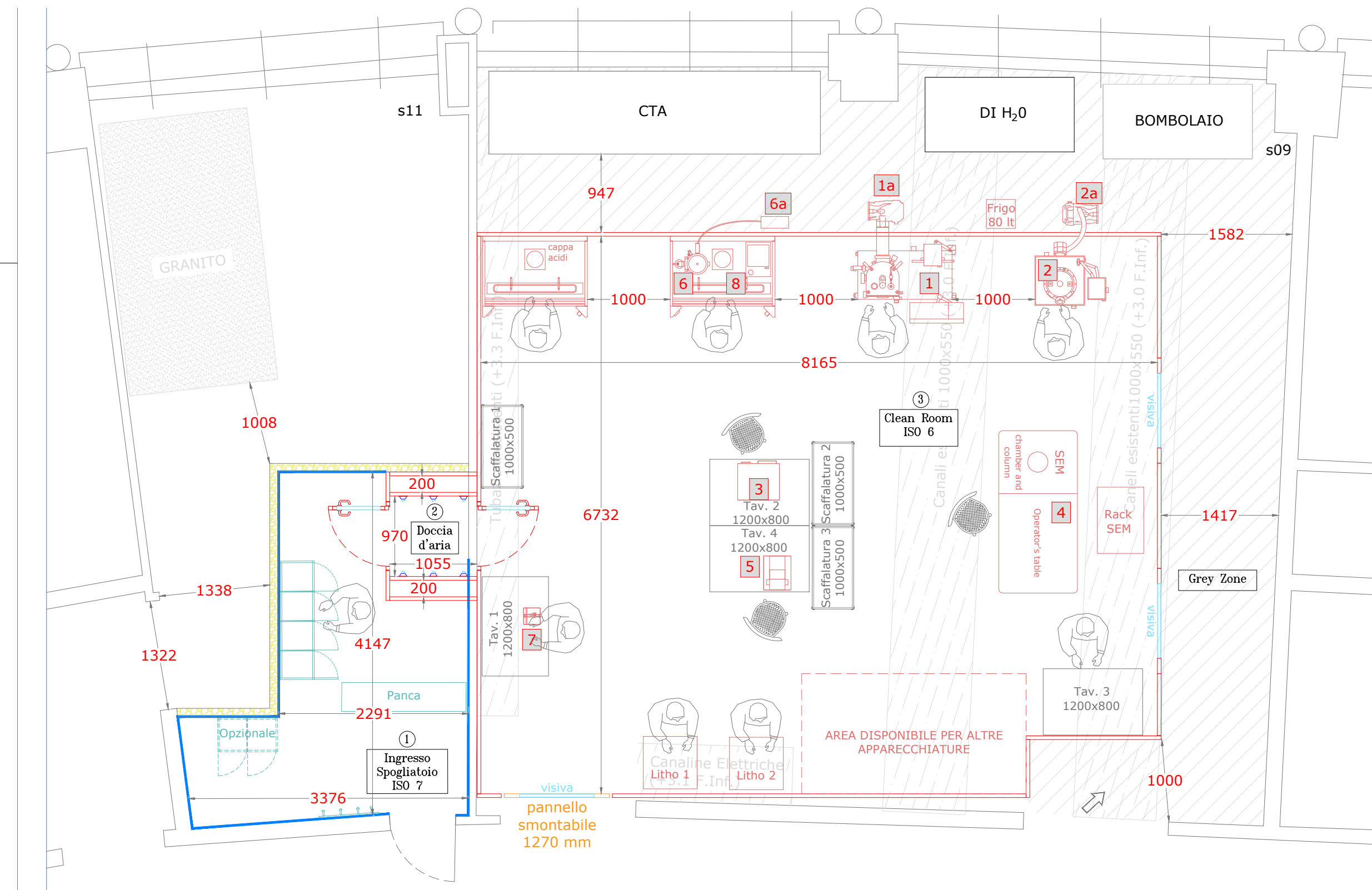


STDM at Sapienza: Microfabrication lab



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preliminary project: start in July 2026



- + 1 technician
- + 1 tenure-track position (condensed matter)
- + 1 tenure-track position (particle physics)



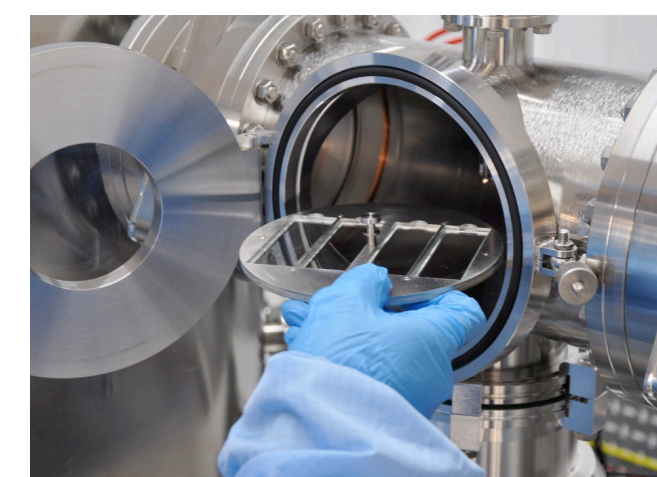
Maskless lithography: Direct Laser Writer: 405nm, high-resolution (down to 0.6 μm), any optical resist



Electron Beam Writer (modified SEM): 30 kV, 100 nm resolution, write-field around 150x150 μm^2



Electron-gun high-vacuum evaporator: for high-purity metals: Nb, Ti, Al, Au, Ag



RF magnetron sputtering: oxides, dielectric multilayers, passivation, isotropic metal coatings...

Thank you!

- Director, for the financial support and for the help in the implementation of the micro-fabrication laboratory
- Lindley, for the enthusiasm in bringing the US community here
- Claudia and Giorgio for the organization
- Speakers: 95% of them accepted the invitation!

