DARWIN: an excellent environment to probe neutrino physics

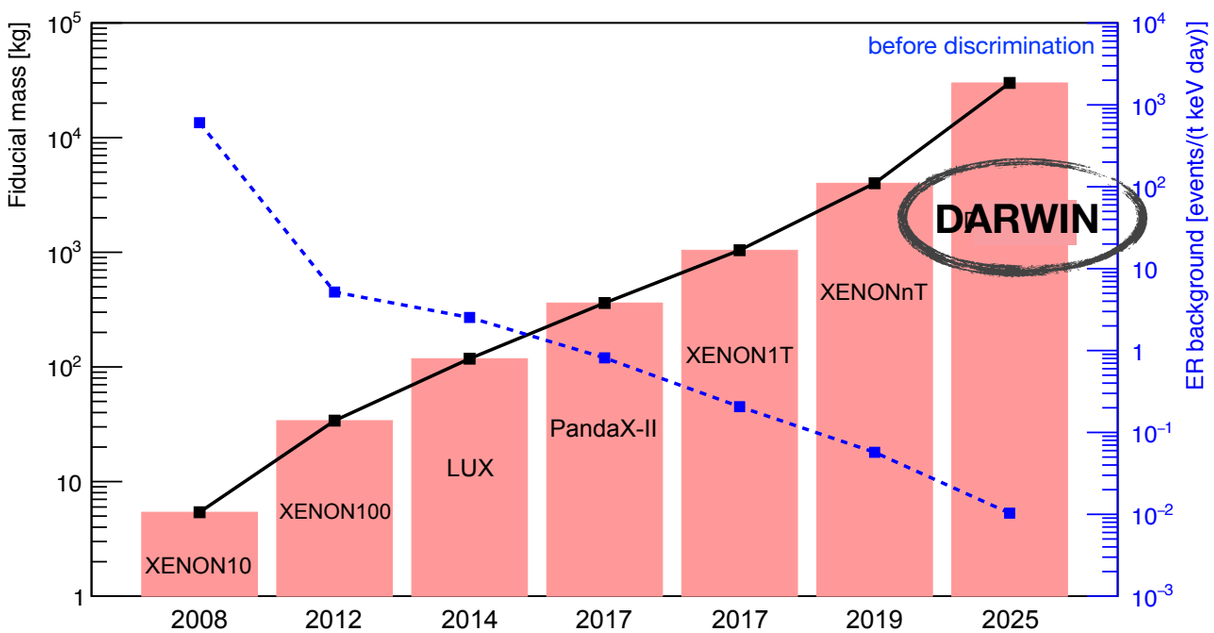
P. Sanchez-Lucas on behalf of the DARWIN collaboration
— University of Zurich —

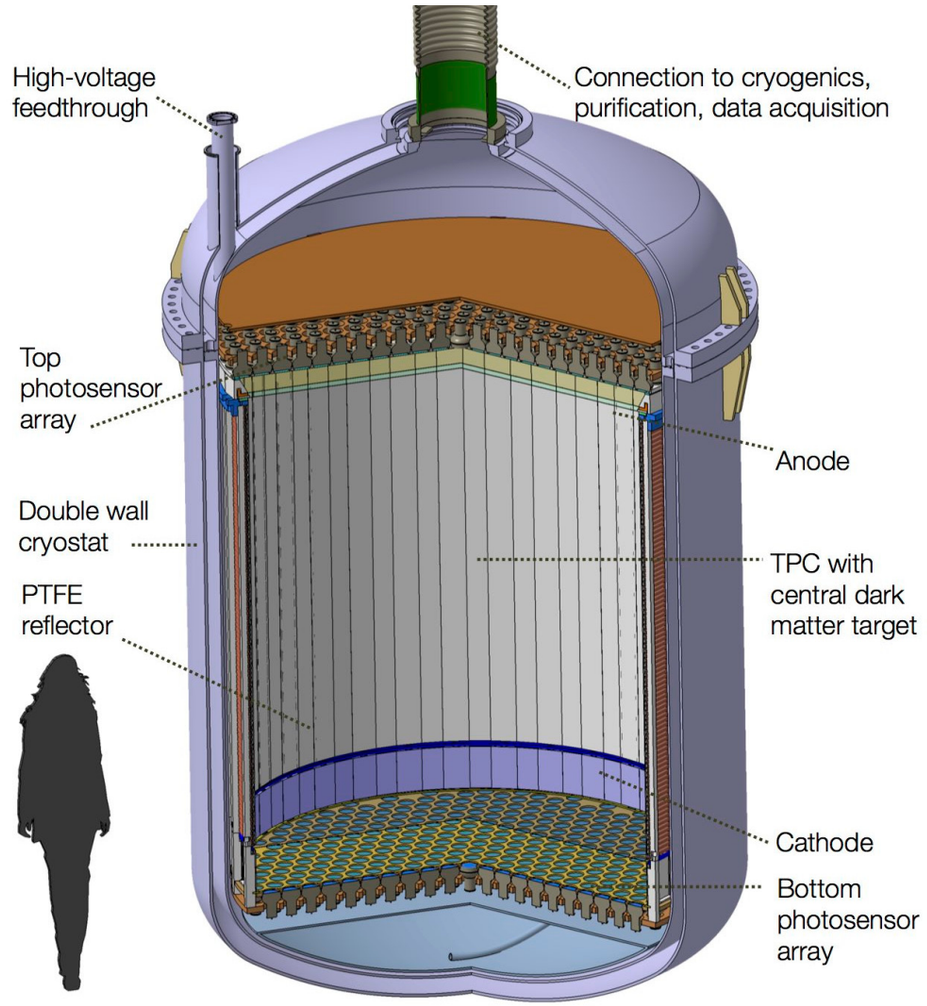
DARWIN
(DARk matter WImp search with liquid xenoN)

With 40 tons of active target, DARWIN will be the **ultimate dark matter detector**, able to explore the entire experimentally accessible parameter space for WIMPs, until neutrinos become an irreducible background.

- ➢ Large detector.
- ➢ Low energy threshold.
- ➢ Ultra low background level.

powerful tool to probe neutrino physics





- Cylindrical dual-phase TPC.
- 2.6 m diameter and 2.6 m height.
- 50 t total (40 t active) of LXe.
- Two arrays of photosensors.
- Low-background cryostat.
- Outer and inner shields.
- ER discrimination level of 99.98%.

www.darwin-observatory.org

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University of Zurich[UZH]

European Research Council

DARWIN

POTENTIAL NEUTRINO CHANNELS

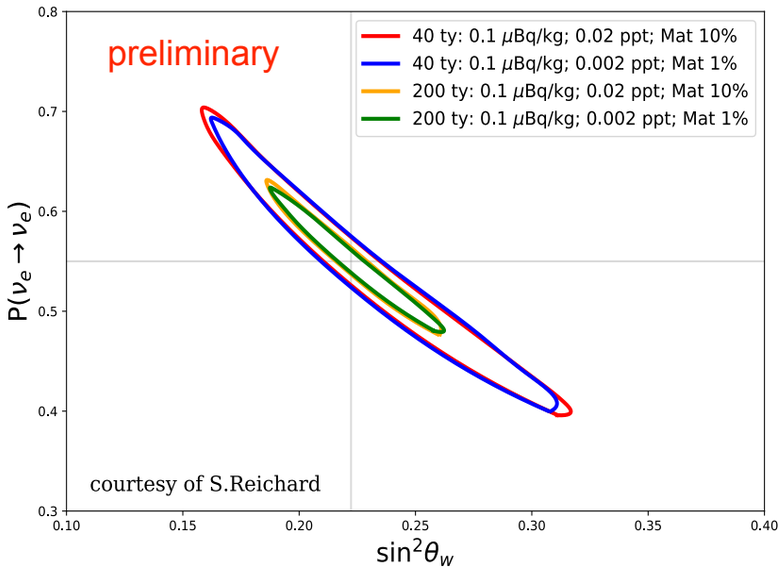
Solar neutrinos

Detection through elastic scattering:

$$\nu_x + e \longrightarrow \nu_x + e$$

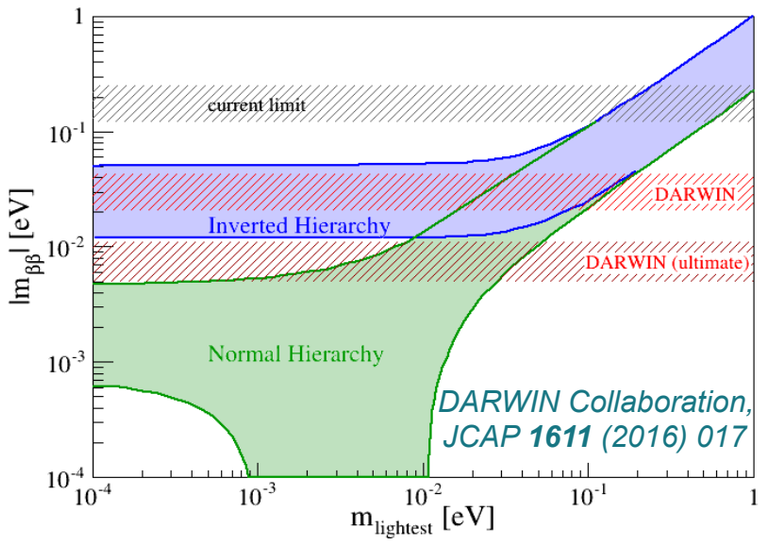
More than 2500 pp-neutrinos per year. Flux measurement with 2% statistical precision.

- Test energy production mechanisms in the Sun.
- Test different neutrinos properties, such as P_{ee} and $sin\theta_W$.



Neutrinoless double-beta decay

^{136}Xe is a good candidate to study if neutrinos are Majorana fermions via the search of the 0νββ-decay.



- 8.9% of natural abundance (3.5 t).
- Q-value at 2.458 MeV.
- Energy resolution ~2%.

DARWIN's sensitivity comparable to future dedicated experiments.

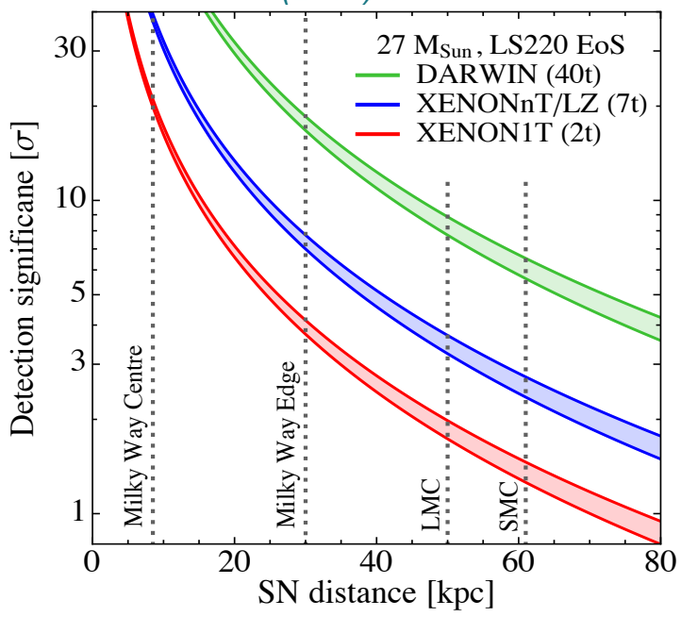
CNNS

The coherent neutrino-nucleus scattering will be detected for different neutrino sources.

$$\nu + A \longrightarrow \nu + A$$

- ~90 events/(t × y) from solar ^{8}B neutrinos.
- Atmospheric neutrinos will produce ~3×10^{-3} events/(t × y).
- All flavors of supernova neutrinos will be observed as well. ~700 neutrinos for a SN of 27 $M_{\odot}$.

*R. F. Lang et al., Phys. Rev. D **94** (2016) 103009*



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