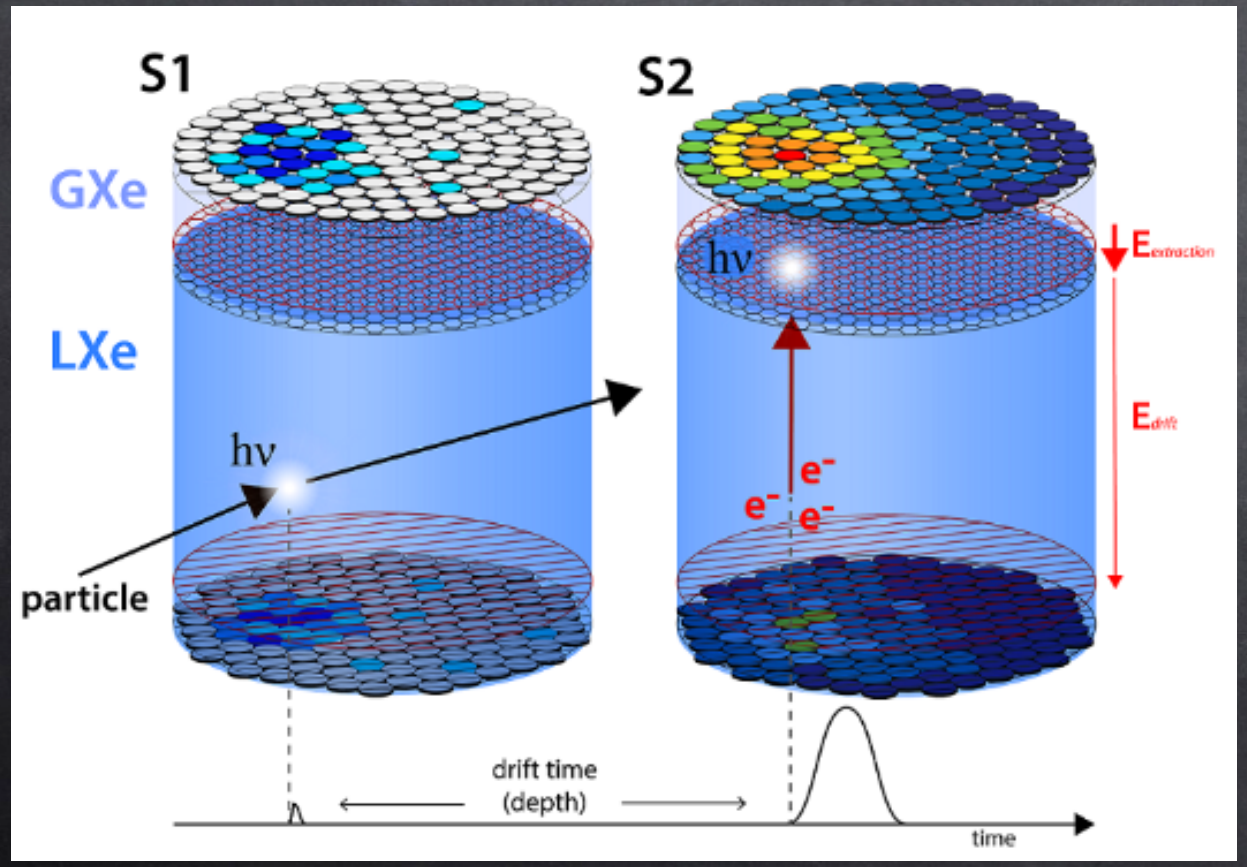
XENON collaboration

180 SCIENTISTS
27 INSTITUTIONS
12 COUNTRIES

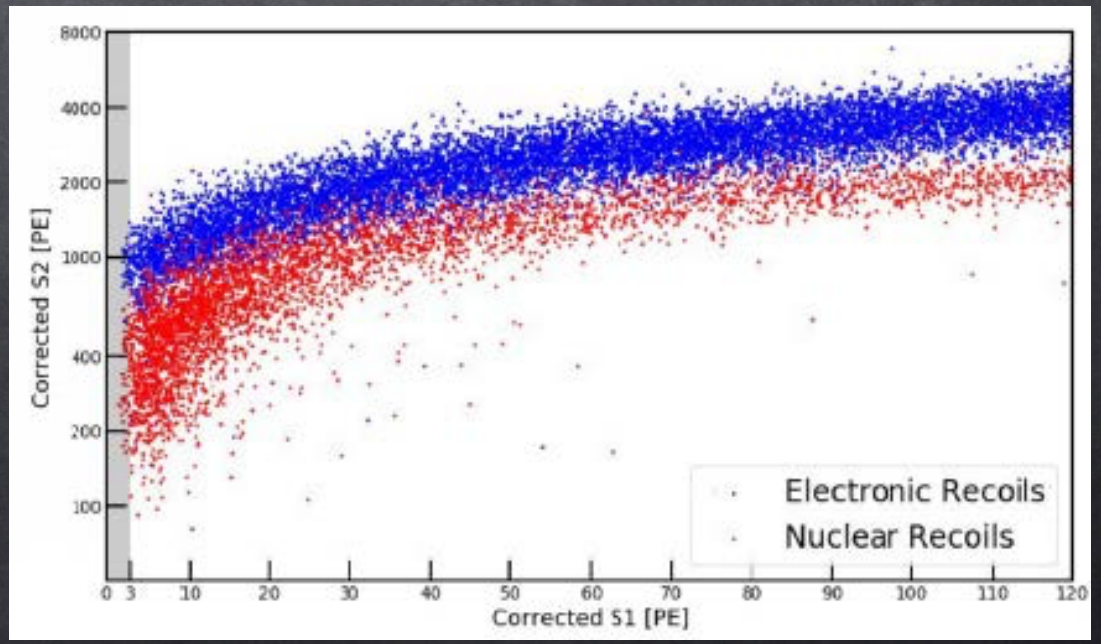
Rivelazione diretta

Time projection chamber in xenon a doppia fase

- Ricostruzione 3D degli eventi
- Discriminazione rinculo nucleare – rinculo elettronico
- Self shielding
- Grossi volumi: 1 T e più

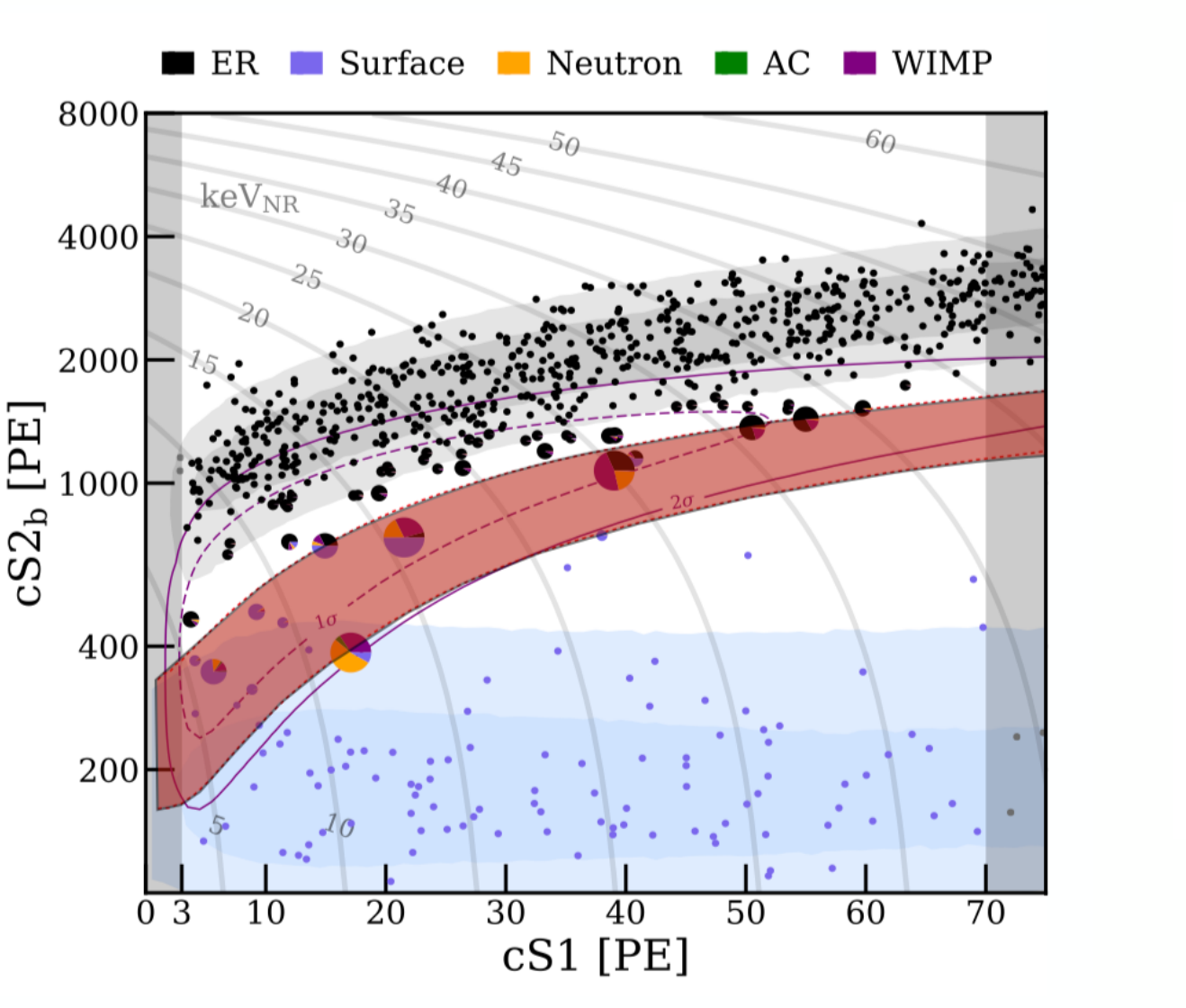


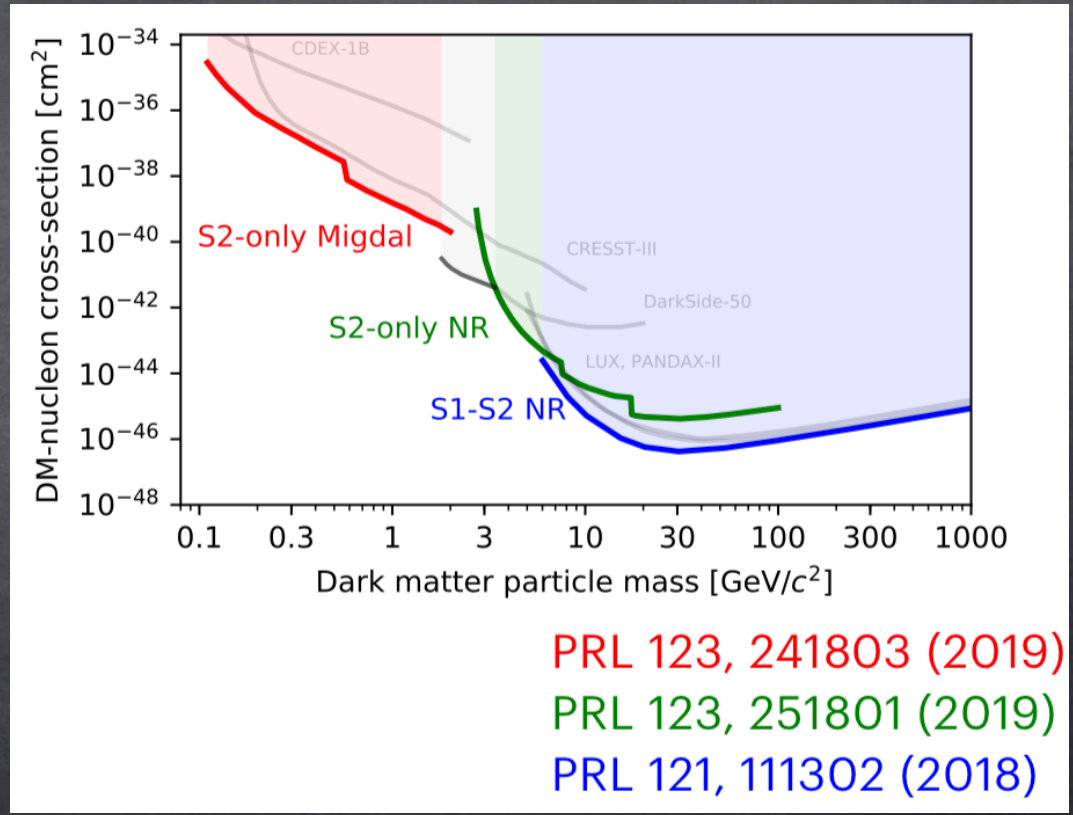
Distribuzione rinculi elettronici (blu) e rinculi nucleari (red).



Rivelazione diretta: risultati – NR

Per un'esposizione 1.0 t·yr: nessun eccesso di eventi di rinculo nuceare

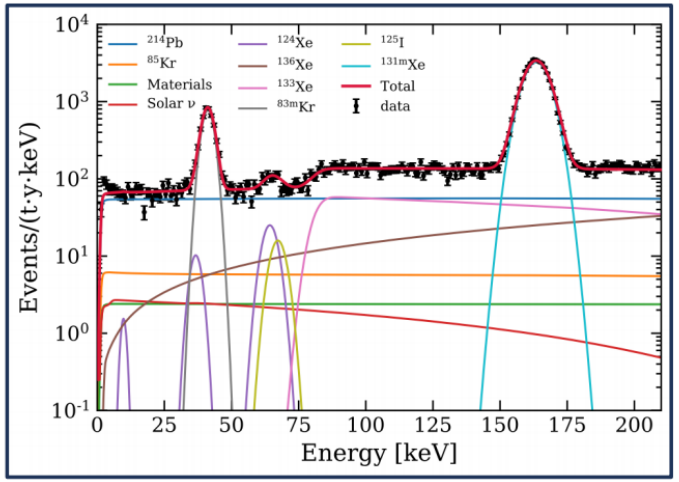


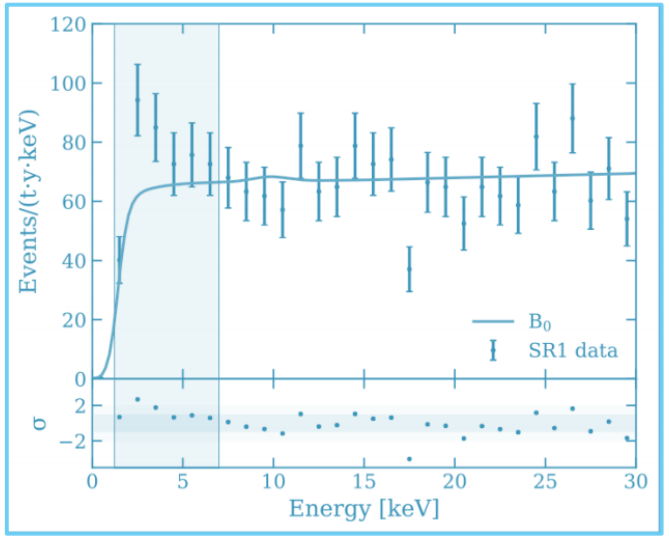


PRL 123, 241803 (2019)
PRL 123, 251801 (2019)
PRL 121, 111302 (2018)

Rivelazione diretta: risultati - ER

Esposizione 0.65 t · yr: C'è un eccesso. Varie ipotesi da verificare con XENONnT





NEW PHYSICS OR UNEXPECTED BACKGROUND?

Phys. Rev. D 102, 072004

3.2σ TRITIUM BACKGROUND

- Fitted concentration: (6.2±2.0) × 10^{-25} mol/mol ^{3}H/Xe
- We don't expect that much ^{3}H from liquid purity
- Very difficult to confirm or exclude such a tiny abundance

3.4σ SOLAR AXIONS

- Non-null coupling to electrons → ABC and/or Primakoff
- Strong tension with astrophysical constraints
- Axions+^{3}H favoured over ^{3}H-only at 2.1 σ

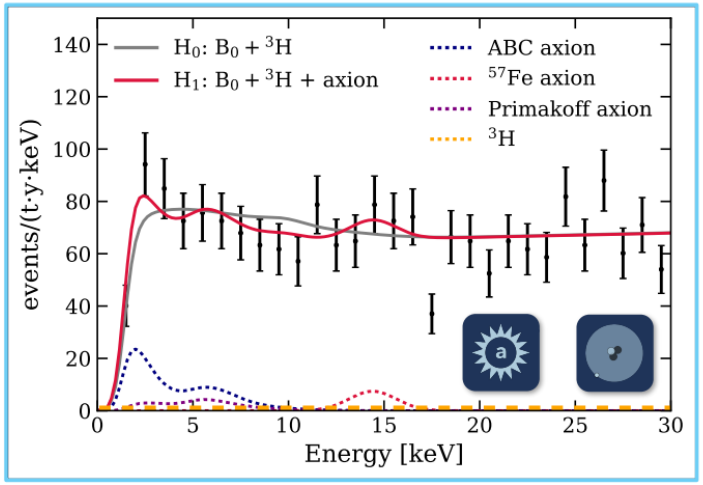
3.2σ NEUTRINO MAGNETIC MOMENT μ_ν

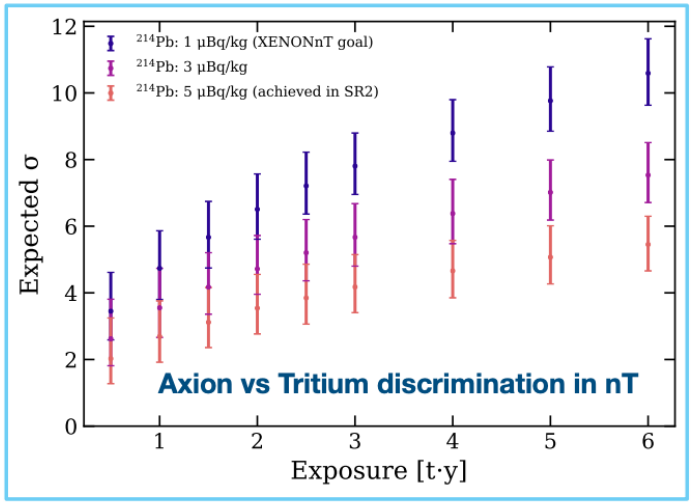
- $\mu_\nu = [1.4, 2.9] \times 10^{-11}\ \mu_B$
- $\mu_\nu > 10^{-15}$ would imply neutrinos to be Majorana fermions
- Tension with astrophysical constraints

3.0σ BOSONIC DARK MATTER

- Including pseudo-scalar (ALPS) and vector (dark photons) bosons
- Most restrictive constraints to date set

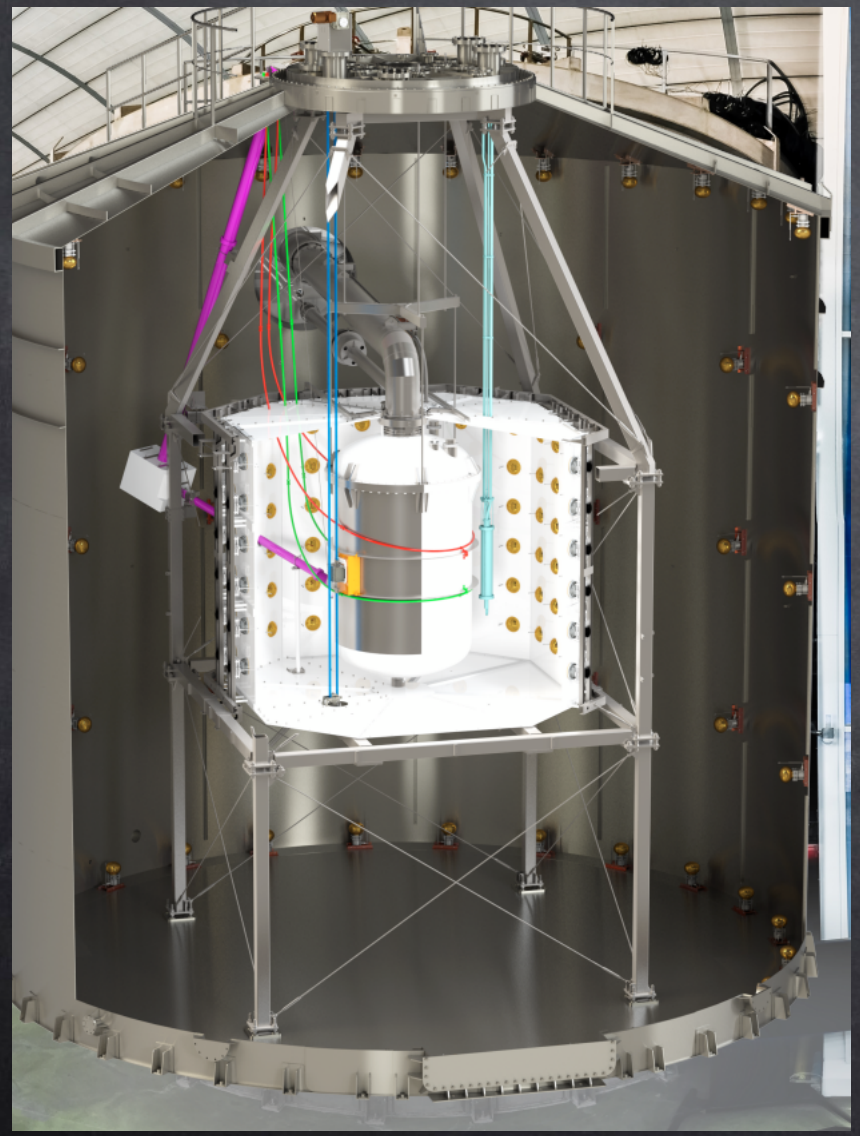
Solar axions + (unconstrained) ^{3}H fit





Costruzione e commissioning di XENONnT

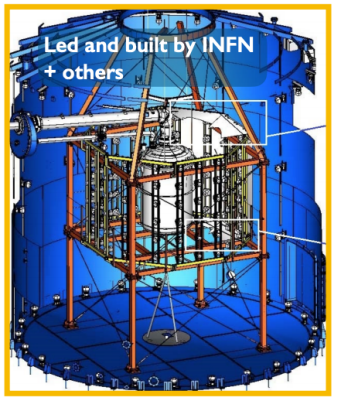
L'aumento di massa ha comportato dei miglioramenti per ridurre il fondo



Contributo di Ferrara al Neutron Veto

Larger TPC

- Total 8.4 t LXe
- 5.9 t in TPC
- ~ 4 t fiducial
- 248 → 494 PMTs



Neutron veto

- Inner region of existing muon veto
- optically separate
- 120 additional PMTs
- Gd in the water tank
- 0.5 % $Gd_2(SO_4)_3$

^{222}Rn distillation

- Reduce Rn (^{214}Pb) from pipes, cables, cryogenic system
- New system, PoP in XENON1T

LXe purification

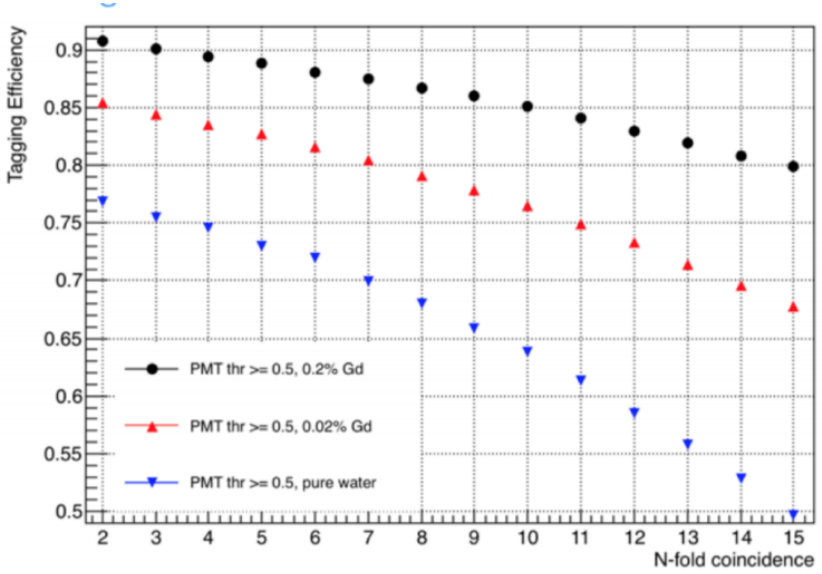
- Faster xenon cleaning
- 5 L/min LXe (2500 slpm)
- XENON1T ~ 100 slpm

Costruzione e commissioning di XENONnT

- Gd-loaded Water: 0.2% of Gd in mass
  -> 3.4 t of Gd-sulphate-octahydrate;
  (technology from EGADS-SK colleagues)

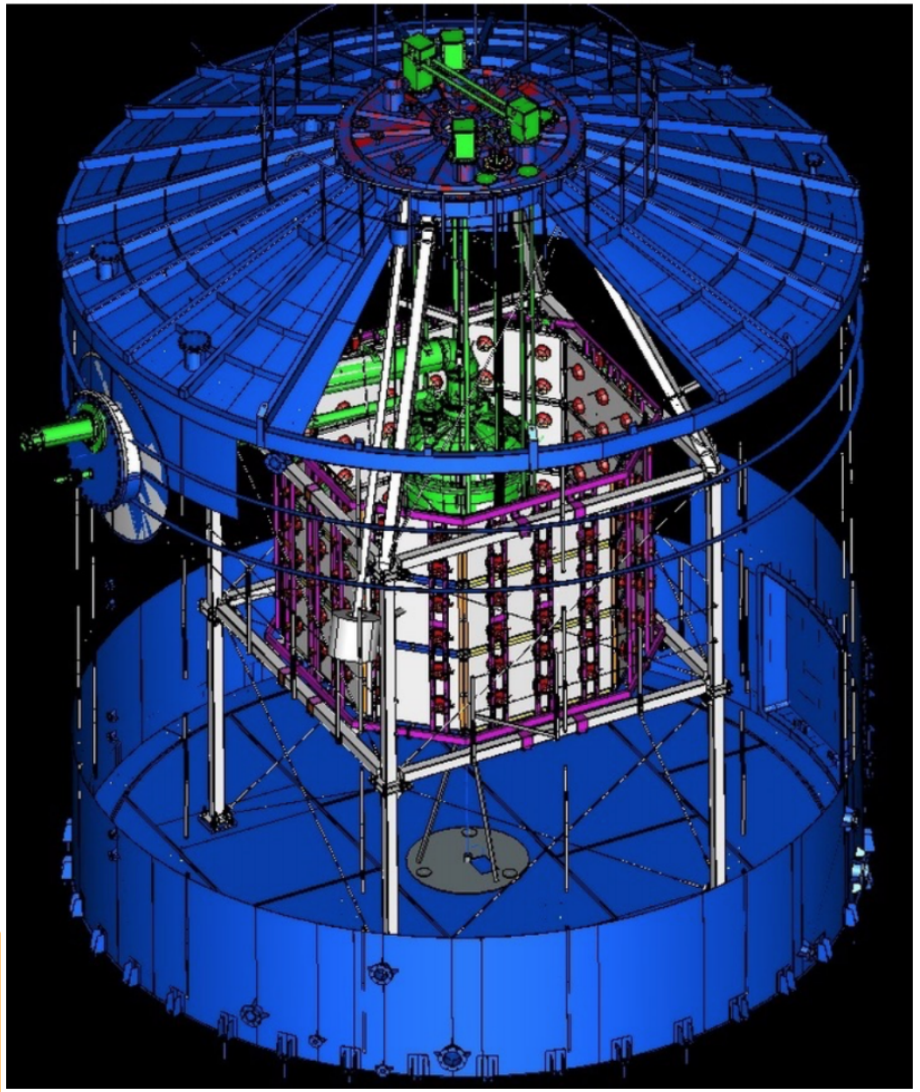
- Cerenkov light is seen by additional 120 8” PMTs placed in water around the cryostat;

- high-reflectivity foil to confine an inner nVeto region with high light collection efficiency.



Neutron tagging efficiency:
85% with 0.2% Gd,
65% with pure water
(requiring a threshold of 10 PMTs in coincidence)

XENONnT nVeto



Costruzione e commissioning di XENONnT

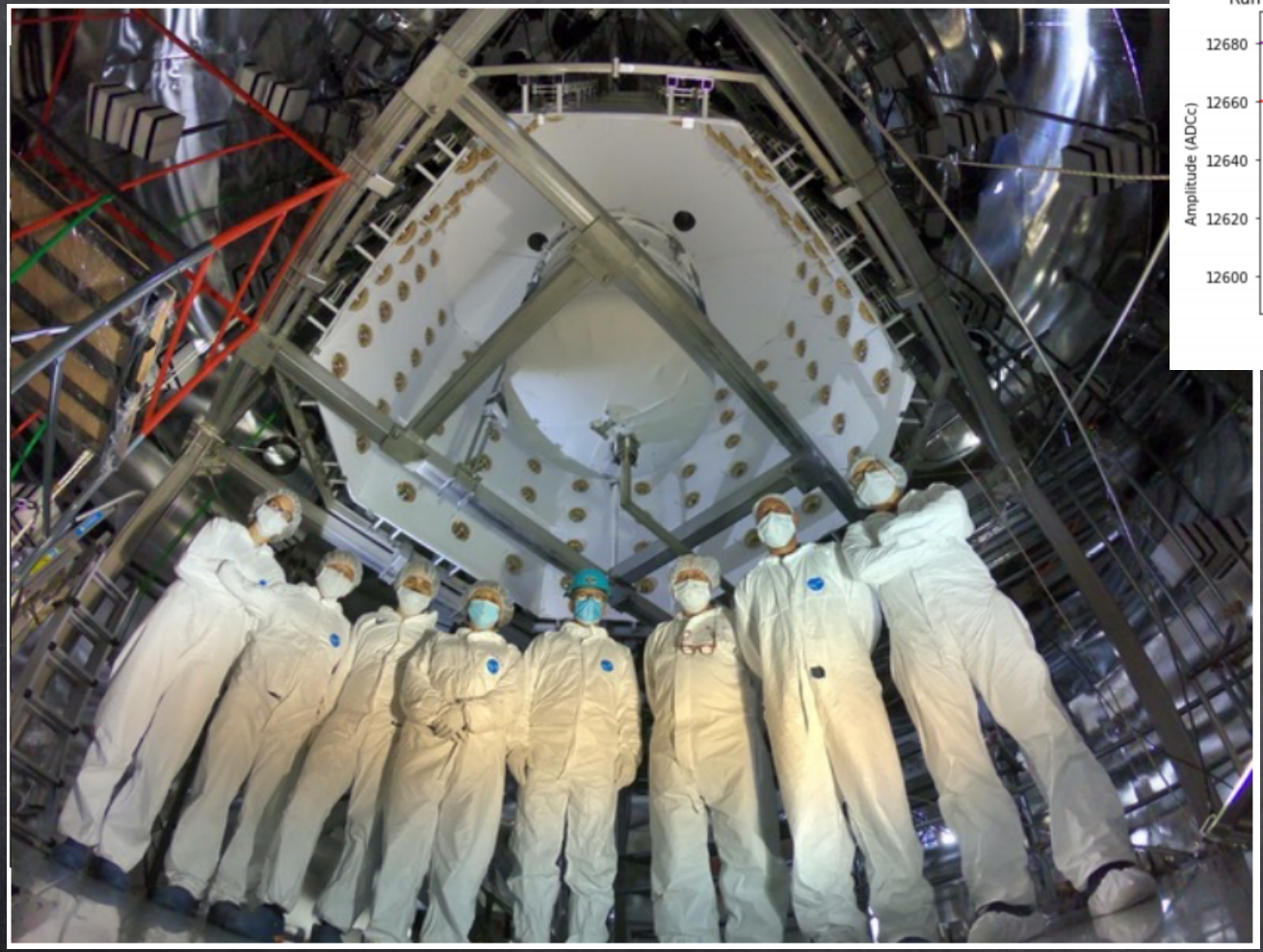
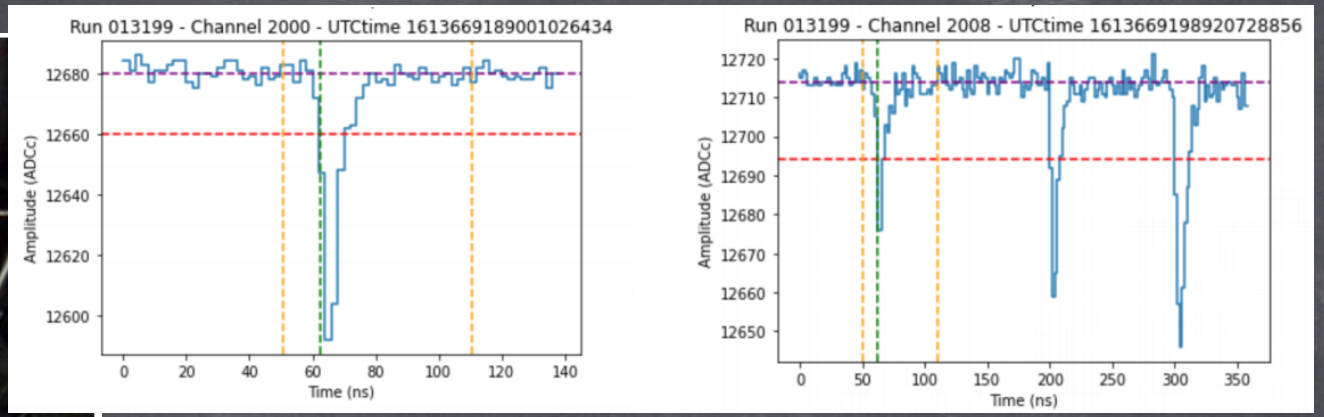
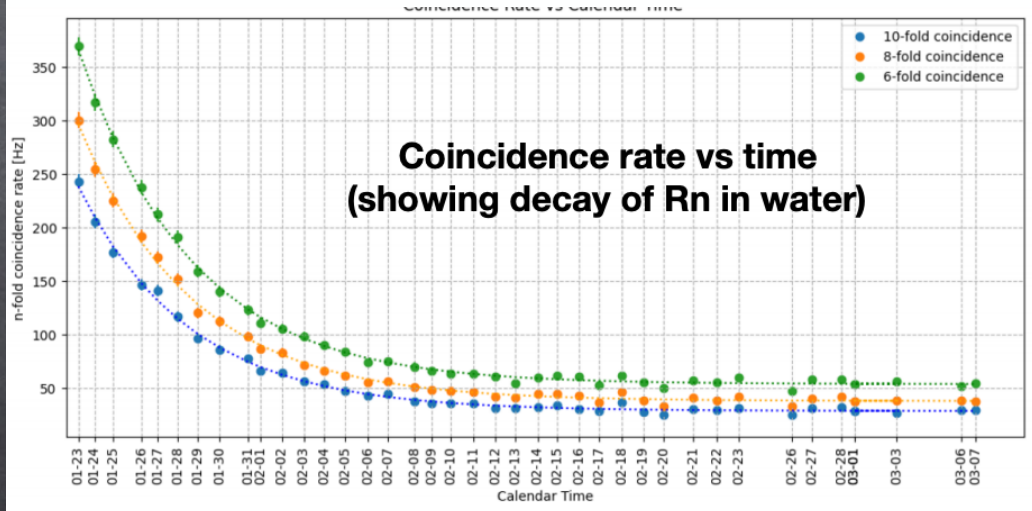


Foto del nVeto da sotto (senza chiusura inferior)

Primo run in corso



Decadimento del ^{222}Rn presente nell'acqua



Very small background rate: 30 Hz at 10-fold PMT coincidence

Preliminary detection efficiency of the ^{208}Tl 2.6 MeV gamma in the middle of the nVeto: 70-80%

Richieste per 2022 (XENON-DTZ)

G. Zavattini 40% Resp. Locale (OK per regole CSNII)
S. Vecchi 30%

	MI	Cons	Manu	App	Tot
FE	7				7