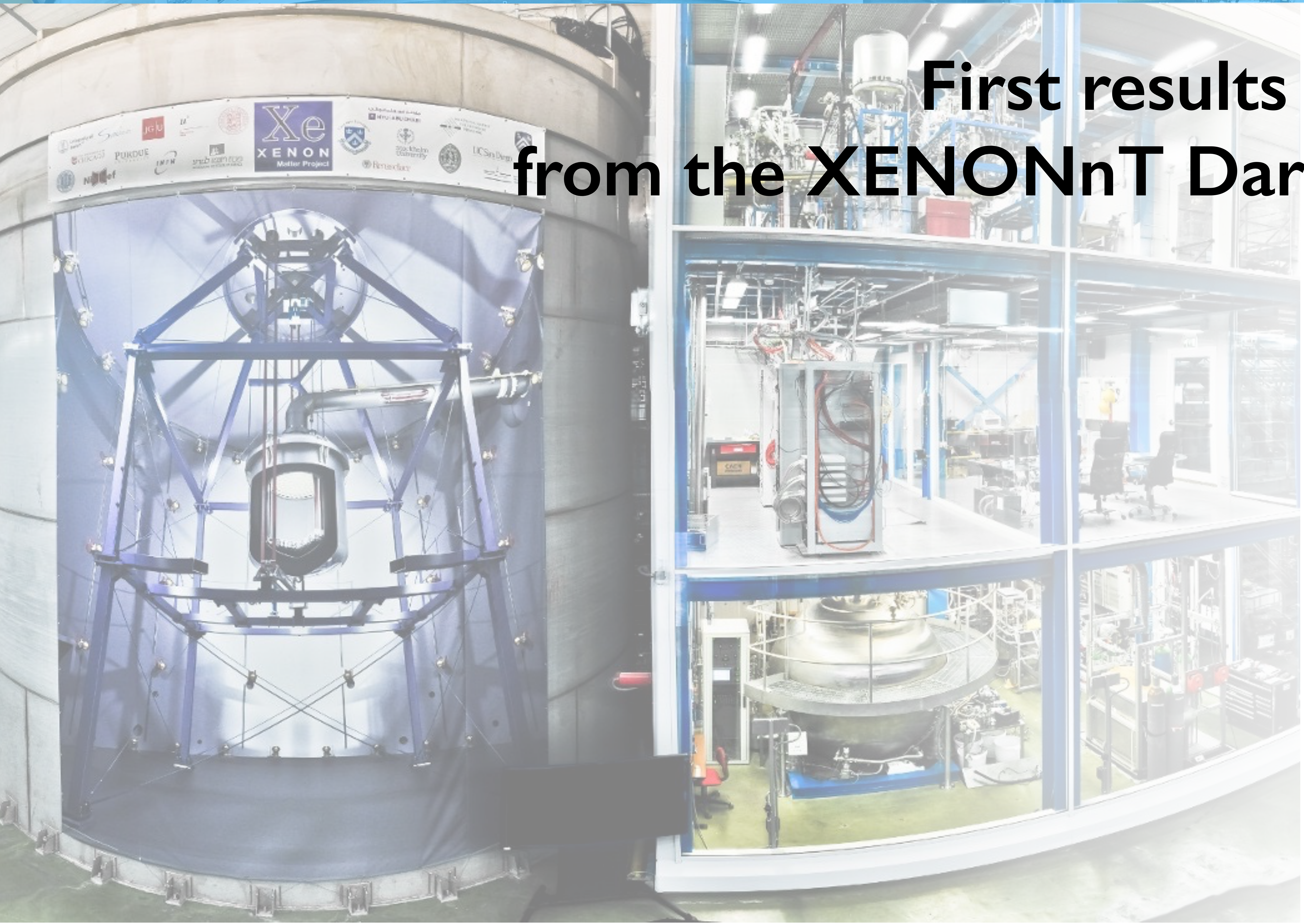


First results on Electronic Recoils from the XENONnT Dark Matter Experiment

Marco Selvi - INFN Bologna
selvi@bo.infn.it

LNGS Seminar - 26 July 2022

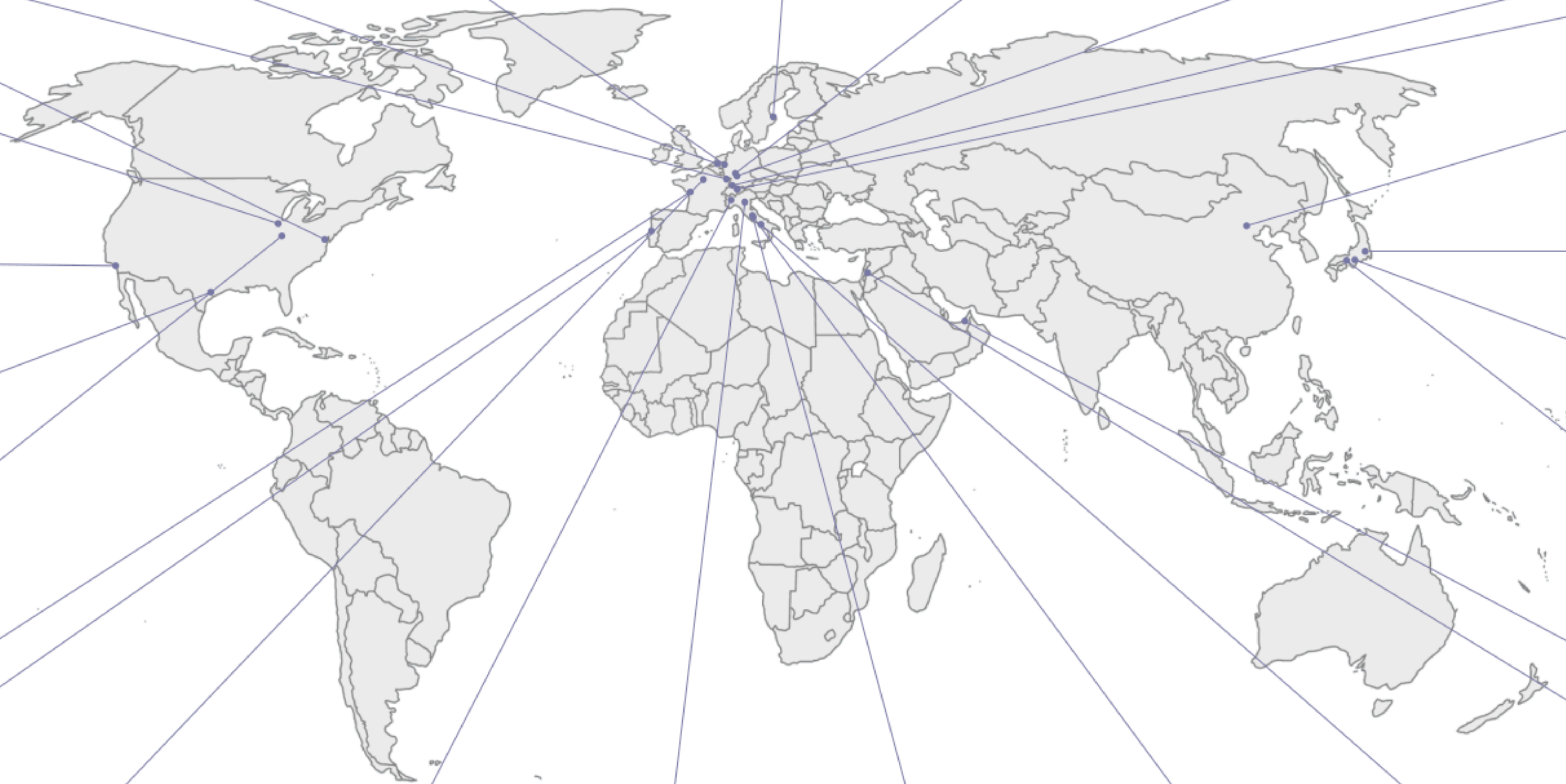
based on arXiv:2207.11330, submitted to PRL

The XENON Collaboration

180 SCIENTISTS 27 INSTITUTIONS 11 COUNTRIES

Columbia
KIT
Nikhef
Muenster
Stockholm
Mainz
MPIK, Heidelberg
Freiburg
Zurich

Chicago
UCSD
Rice
Purdue



Tsinghua
Tokyo
Nagoya
Kobe

Subatech
Coimbra
LPNHE
Torino
Bologna
L'Aquila
LNGS
Napoli
Weizmann
NYUAD

The XENON Collaboration

Collaboration Meeting in Torino, 4-7 July 2022, back to meeting in person !!

XENON at LNGS

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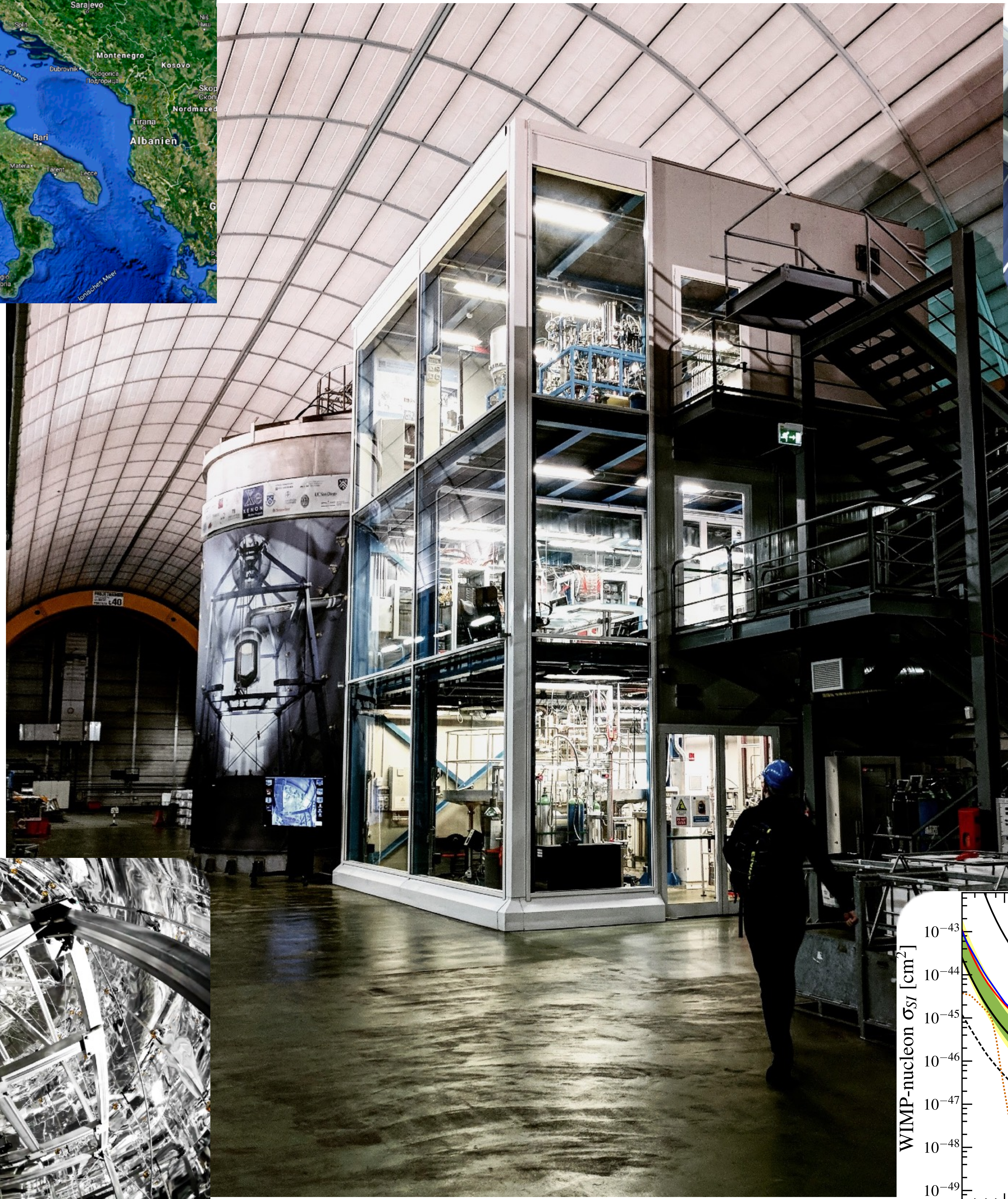
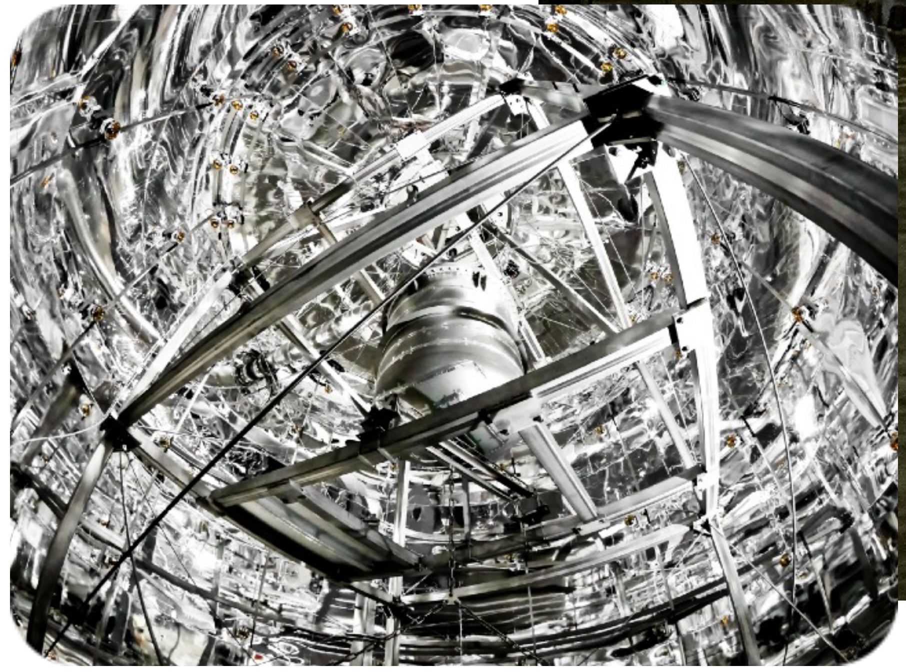
Located underground at the INFN Laboratori Nazionali del Gran Sasso, Italy

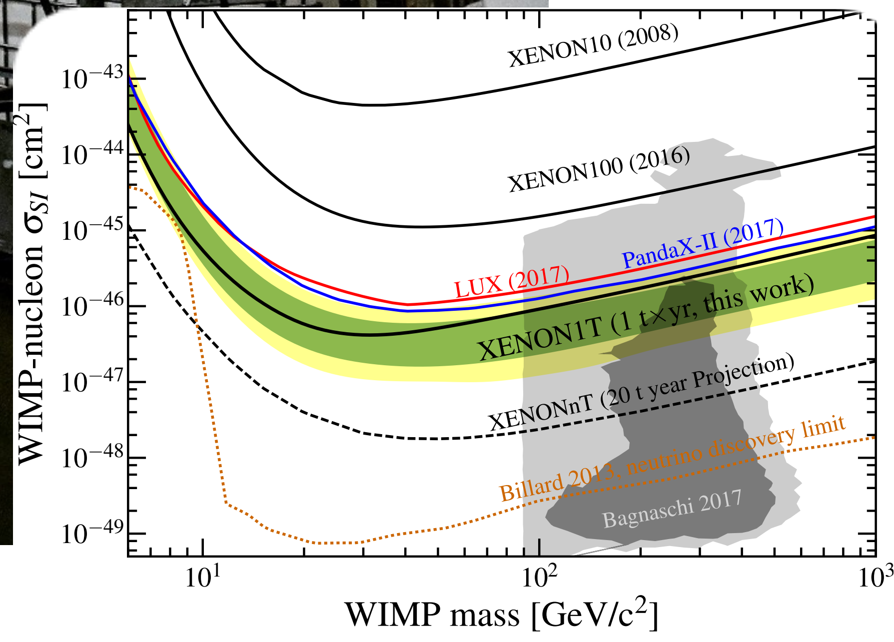
1500 m rock overburden (3600 m w.e.)

EPJC (2017) 77:881
EPJC (2017) 77:275
EPJC (2017) 77:890
JINST 9, P11006 (2014)



PRL 121, 111302 (2018)
PRL 122, 071301 (2019)
PRL 122, 141301 (2019)





LXe dual-phase TPC principles

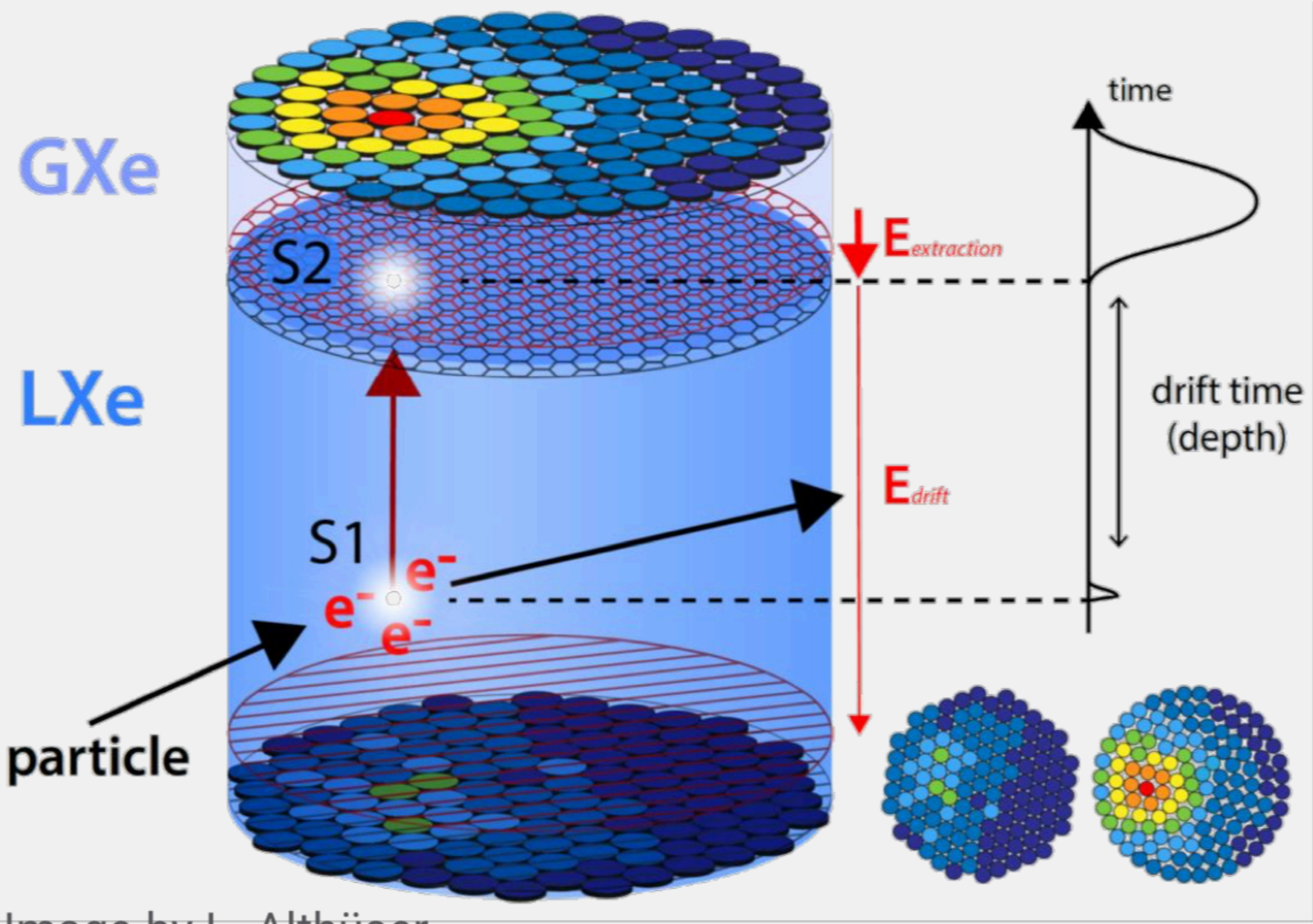


Image by L. Althüser

S1 light signal:
- prompt scintillation photons

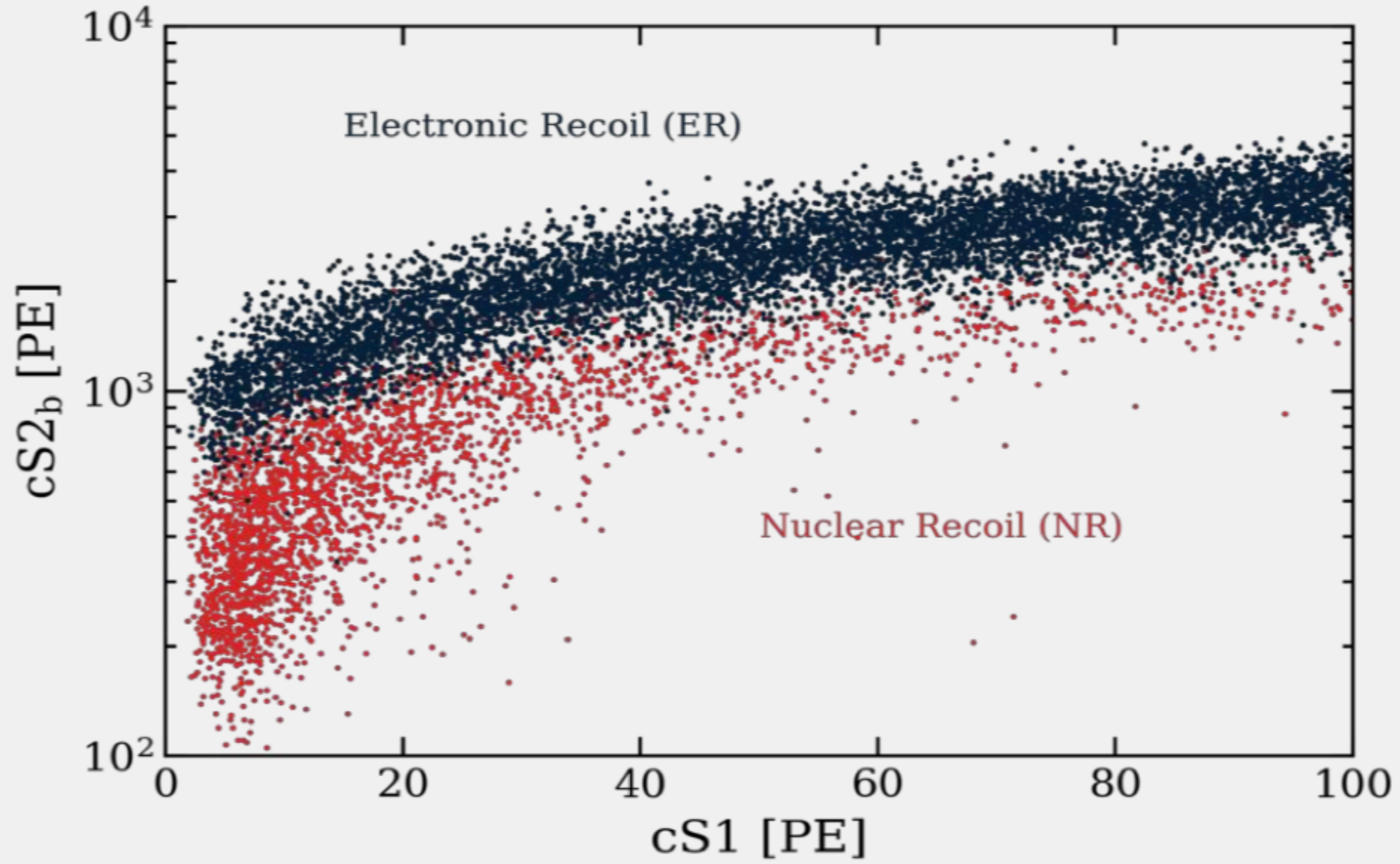
S2 charge signal:
- secondary scintillation photons from electroluminescence in GXe due to drifted electrons

3D vertex reconstruction:
- X,Y: S2 hit pattern
- Z: drift time S2-S1

NR (Nuclear Recoils)
WIMP signal, neutrons, CEvNs

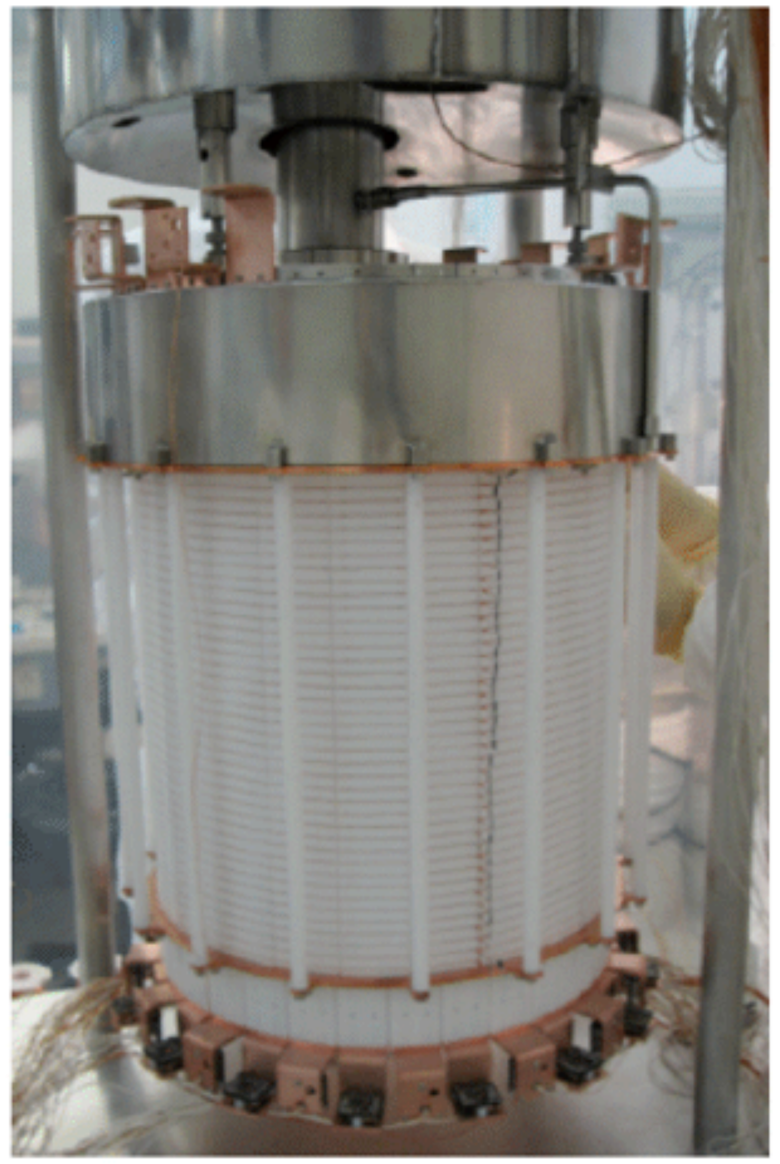
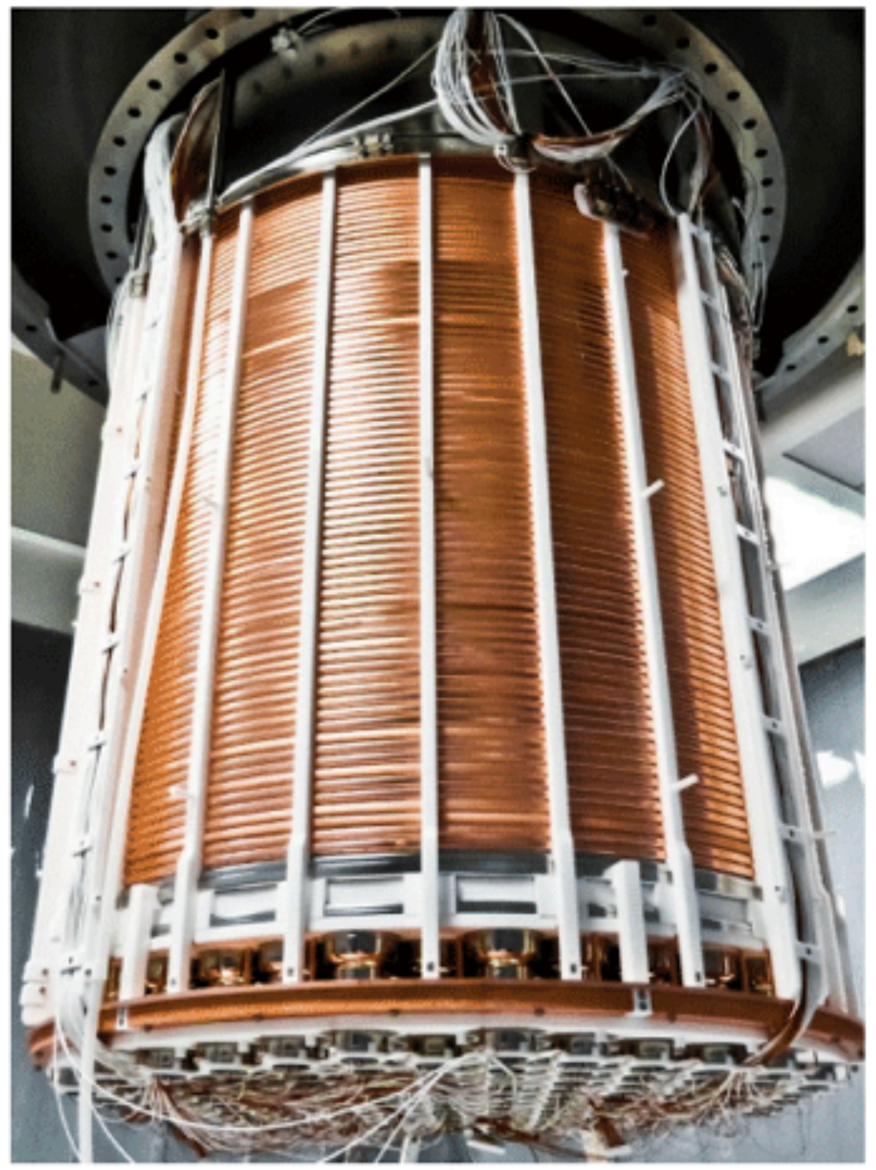
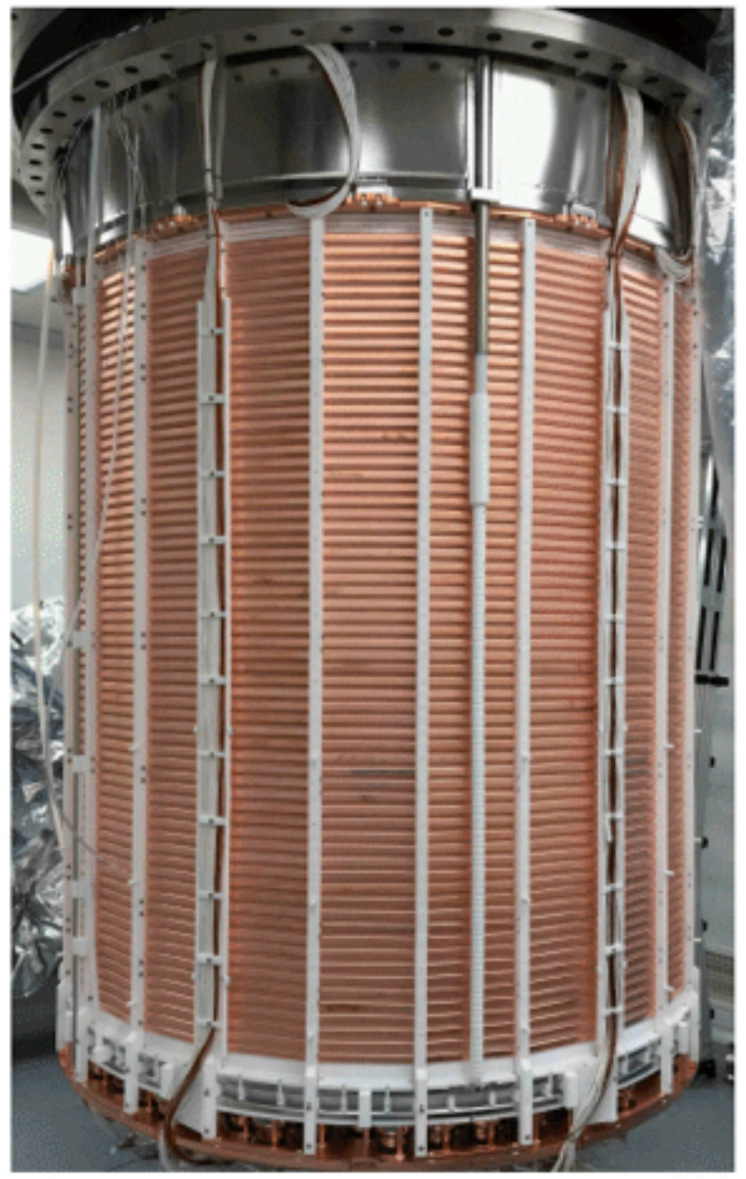
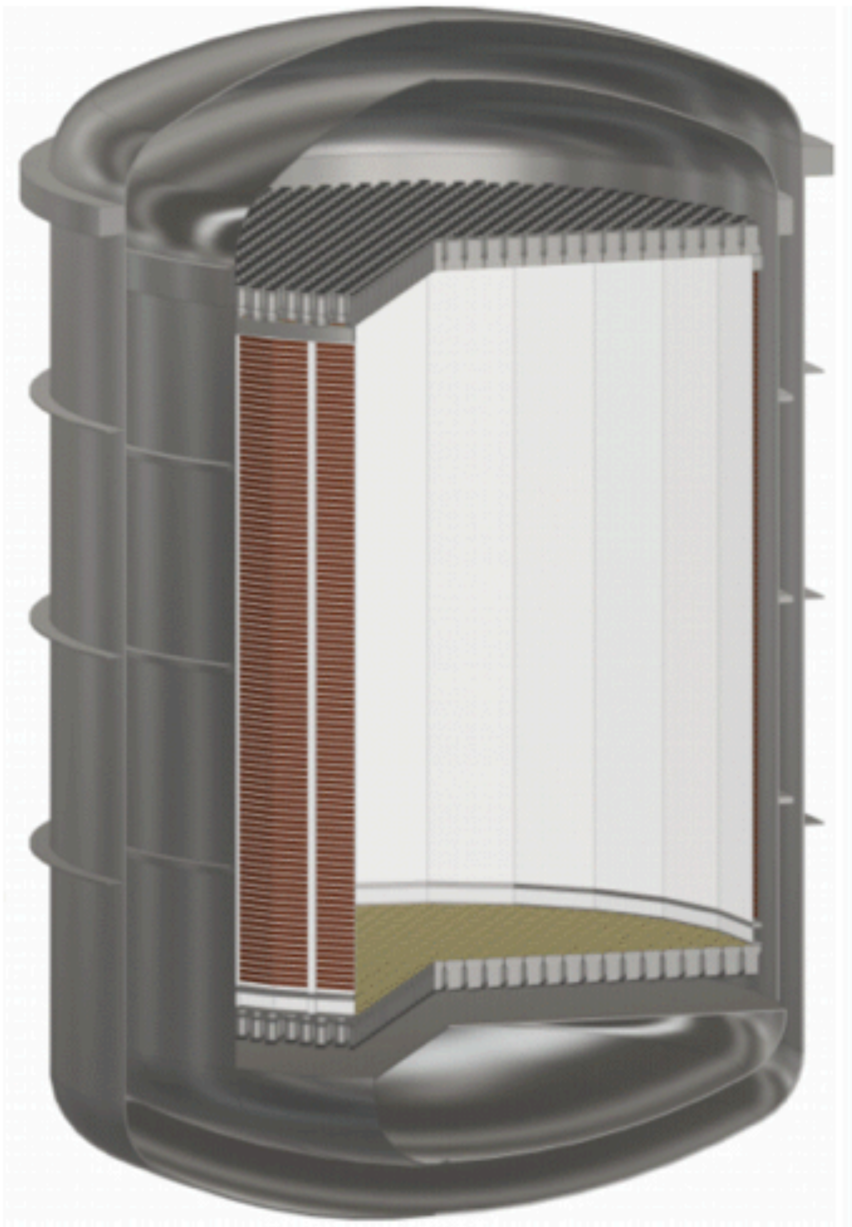
ER (Electronic Recoils)
γ, β backgrounds

Discrimination from S2/S1
Larger for ER than NR



Outline: the XENON project @LNGS

XENON10 XENON100 XENON1T XENONnT DARWIN

2005-2007	2008-2016	2012-2018	2020-2025	2027–
15 kg	161 kg	3200 kg	8400 kg	50 tonnes
15 cm	30 cm	96 cm	150 cm	260 cm

Outline: the XENON project @LNGS

Past | Future

	XENON10	XENON100	XENON1T	XENONnT	DARWIN
Year	2005	2008	2016	2020	* 2027
Active mass	15 kg	62 kg	2.0 t	5.9 t	* 40 t
Background $(t\ d\ keV)^{-1}$	~1000	5.3	0.2	* 0.04 **Now measured**	*0.01
Sensitivity cm^2	4.5×10^{-44}	1.1×10^{-45}	4.1×10^{-47}	* 1.4×10^{-48}	* $\sim10^{-49}$

THE OTHER LXe TPCs

	LUX	PANDAX	LZ	PANDAX-4T
Year	2013	2016	~2020	~2021
Active mass	250 kg	580 kg	~7 t	4 t
Background	2.6	0.8	* 0.04	* 0.05
Sensitivity	2.2×10^{-46}	2.2×10^{-46}	* 1.6×10^{-48}	* 6×10^{-48}

Summary of XENON1T results

WIMP DARK MATTER

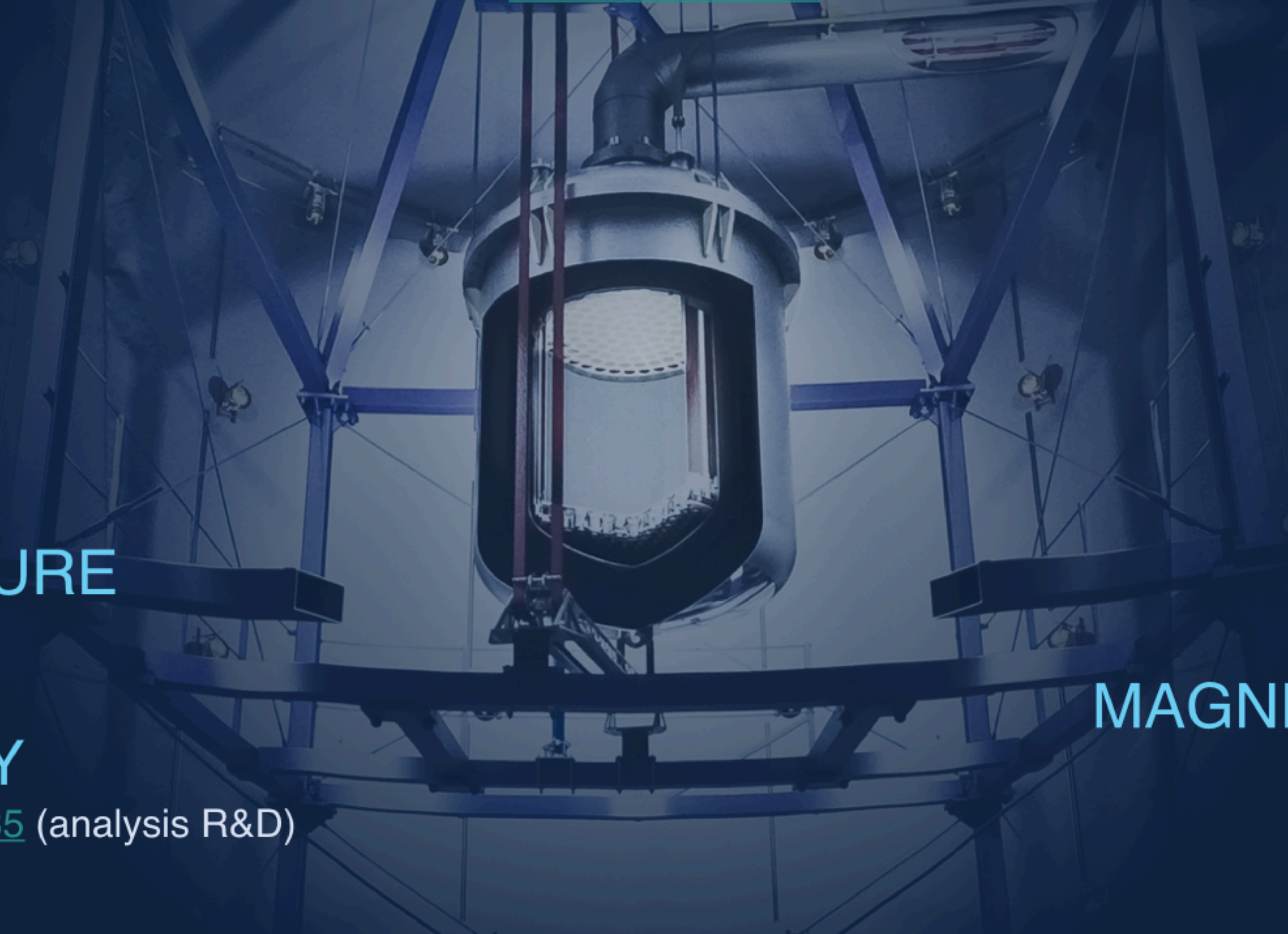
PRL 119, 181301
PRL 121, 111302
PRL 122, 071301
PRL 122, 141301
PRL 126, 091301
PRD 103, 063028

LIGHT DARK MATTER

PRL 123, 241803
PRL 123, 251801

BOSONIC DARK MATTER

PRD 102, 072004



SOLAR ^{8}B CEvNS

PRL 126, 091301

SOLAR AXIONS

PRD 102, 072004

DOUBLE ELECTRON CAPTURE

Nature 568, 532

arXiv:2205.04158

0vbb DECAY

EPJ C (2020) 80:785 (analysis R&D)

NEUTRINO MAGNETIC MOMENT

PRD 102, 072004

TECHNICAL ANALYSIS PAPERS

PRD 99, 112009
PRD 100, 052014

XENON1T WIMP search summary

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WORLD LEADING CONSTRAINTS ON WIMP-NUCLEON INTERACTION

For WIMP masses in the range [0.1, 2) - (3, 1000] GeV/c²

1 tonne-year

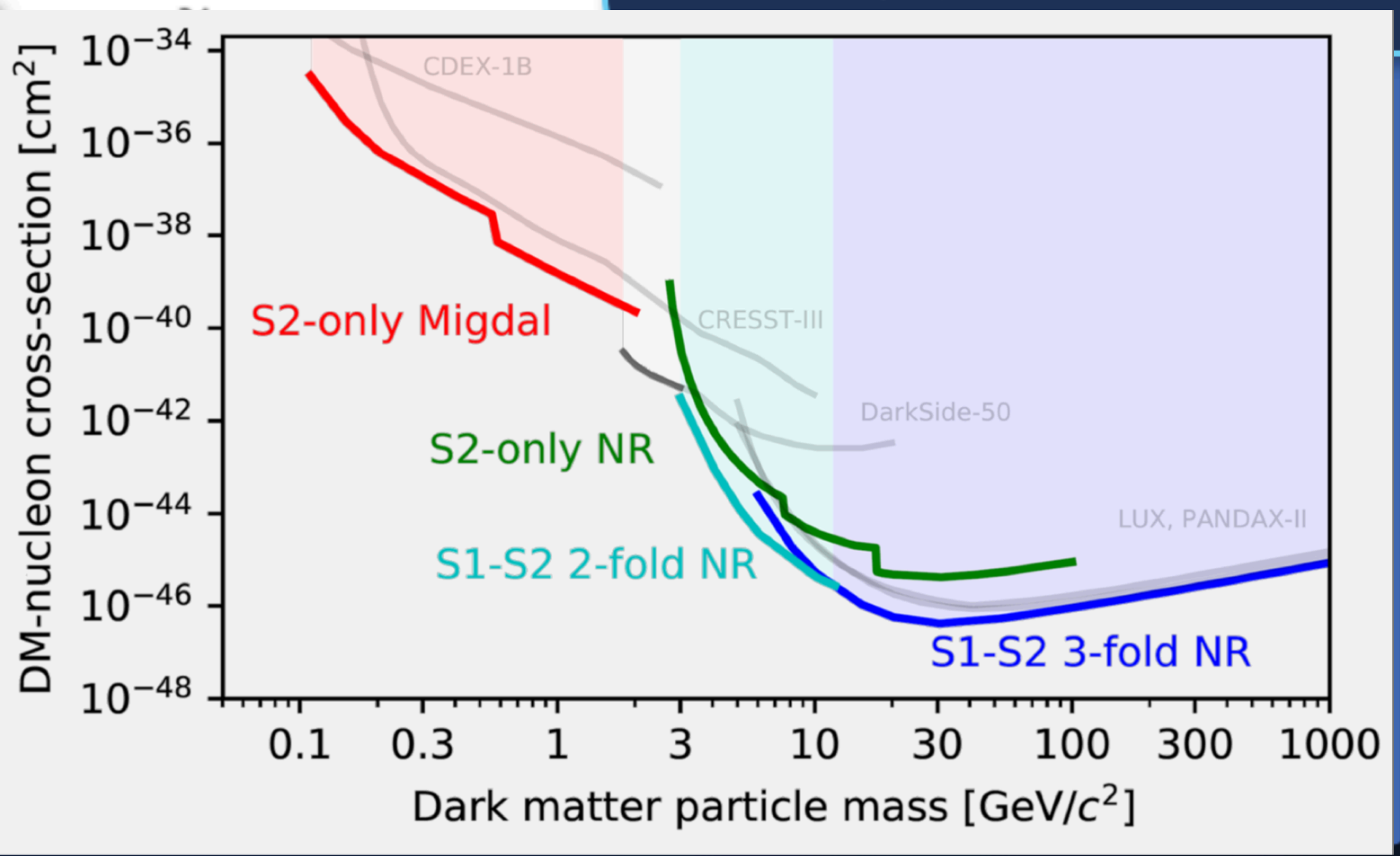
Total exposure for the main WIMP search
1.3 t fiducial LXe mass
278.8 live days (Nov 2016 – Feb 2018)

Dark Matter Search Results from a One Ton-Year Exposure of XENON1T, PRL 121, 111302

Light dark matter search with ionization signals in XENON1T | PRL 123, 251801

Search for Light Dark Matter Interactions Enhanced by the Migdal Effect or Bremsstrahlung in XENON1T | PRL 123, 241803

Search for Coherent Elastic Scattering of Solar ⁸B Neutrinos in the XENON1T Dark Matter Experiment | PRL 126, 091301



4.1×10^{-47} cm² @ 30 GeV/c² WIMP mass

WR

...until Panda-X and LZ non-blinded analyses

Detector with:

Low background: 76 ± 2 events/t/yr/keV

Low threshold: ~5 keV_{NR}

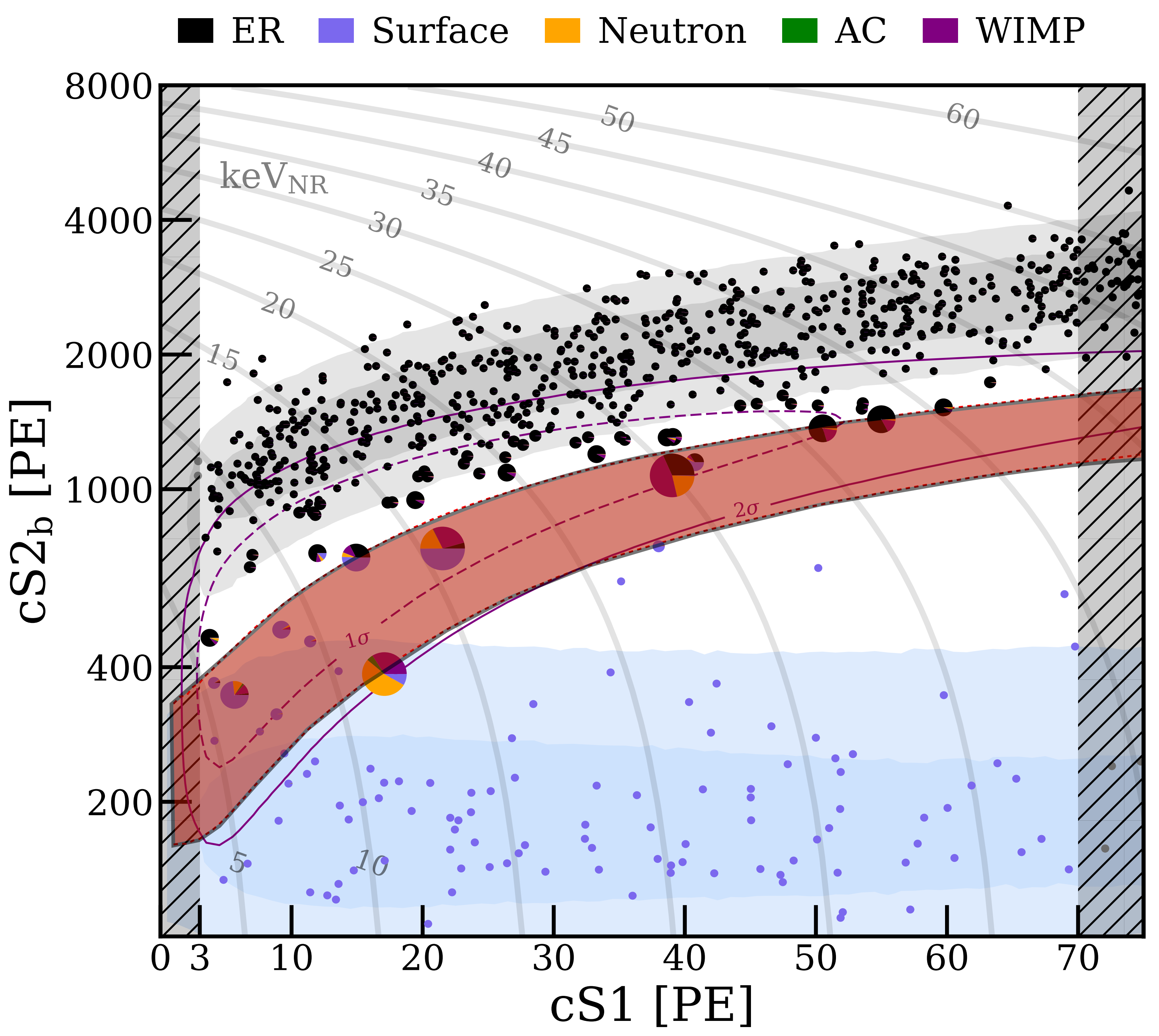
Large exposure (mass, livetime): 1 tonne x year

Combination of S1 and S2 signals allow:

Position reconstruction

Energy reconstruction

ER/NR discrimination



Most stringent result on WIMP Dark Matter down to 3 GeV/c² masses

[PRL 121, 111302 + PRL 123, 251801]

Detector with:

Low background: 76 ± 2 events/t/yr/keV

Low threshold: 1 keV_{ee}

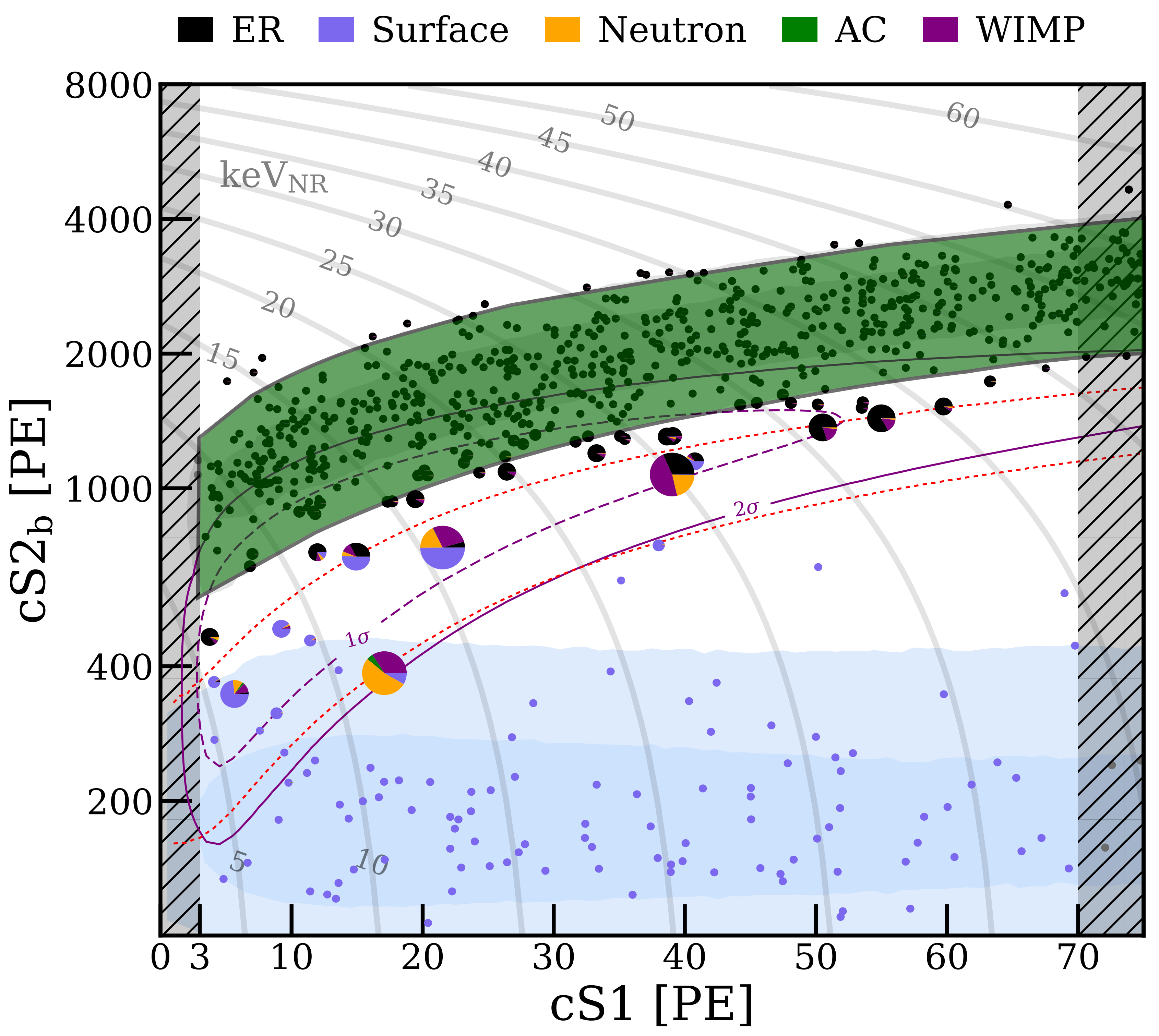
Large exposure (mass, livetime): 1 tonne x year

Combination of S1 and S2 signals allow:

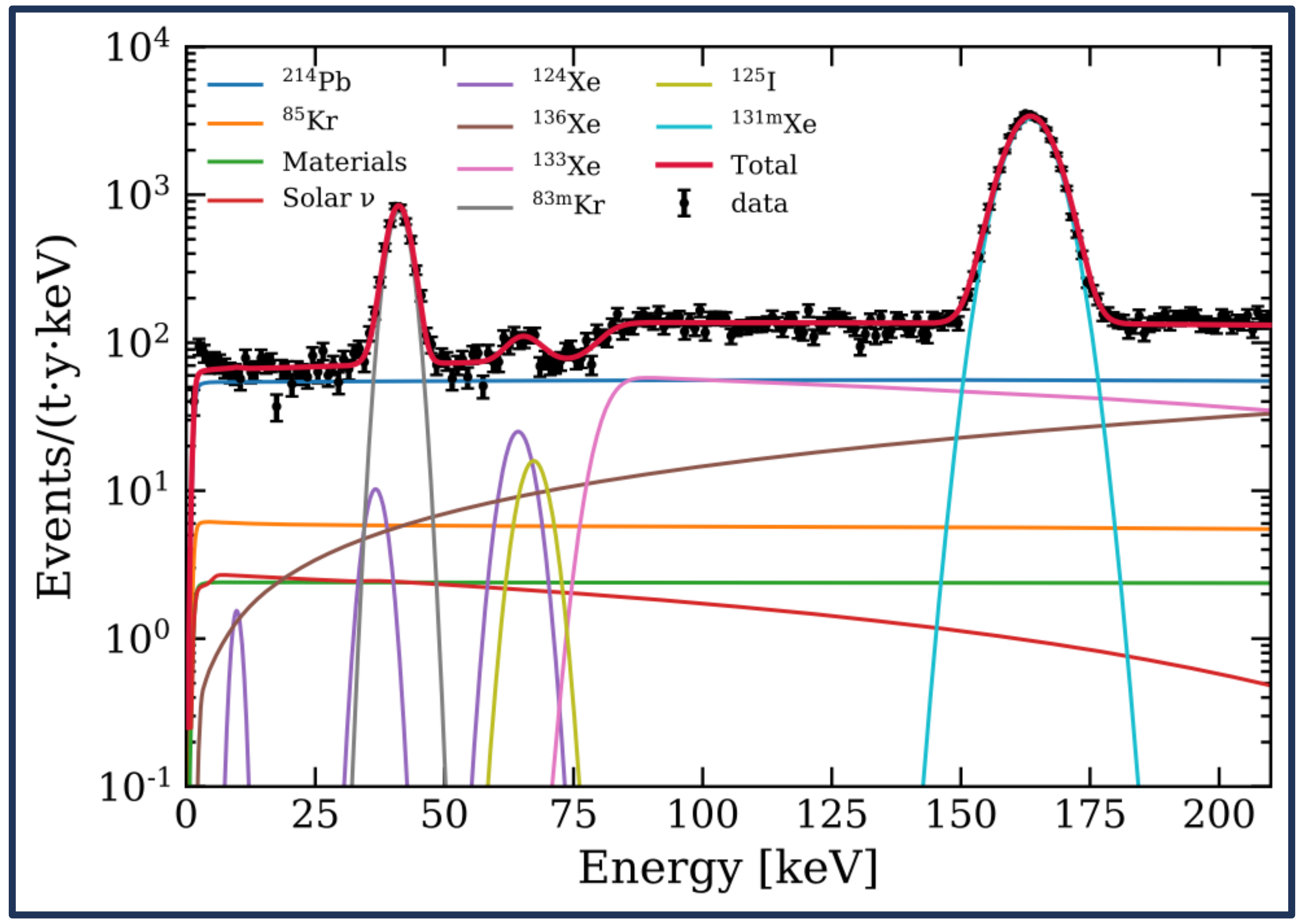
Position reconstruction

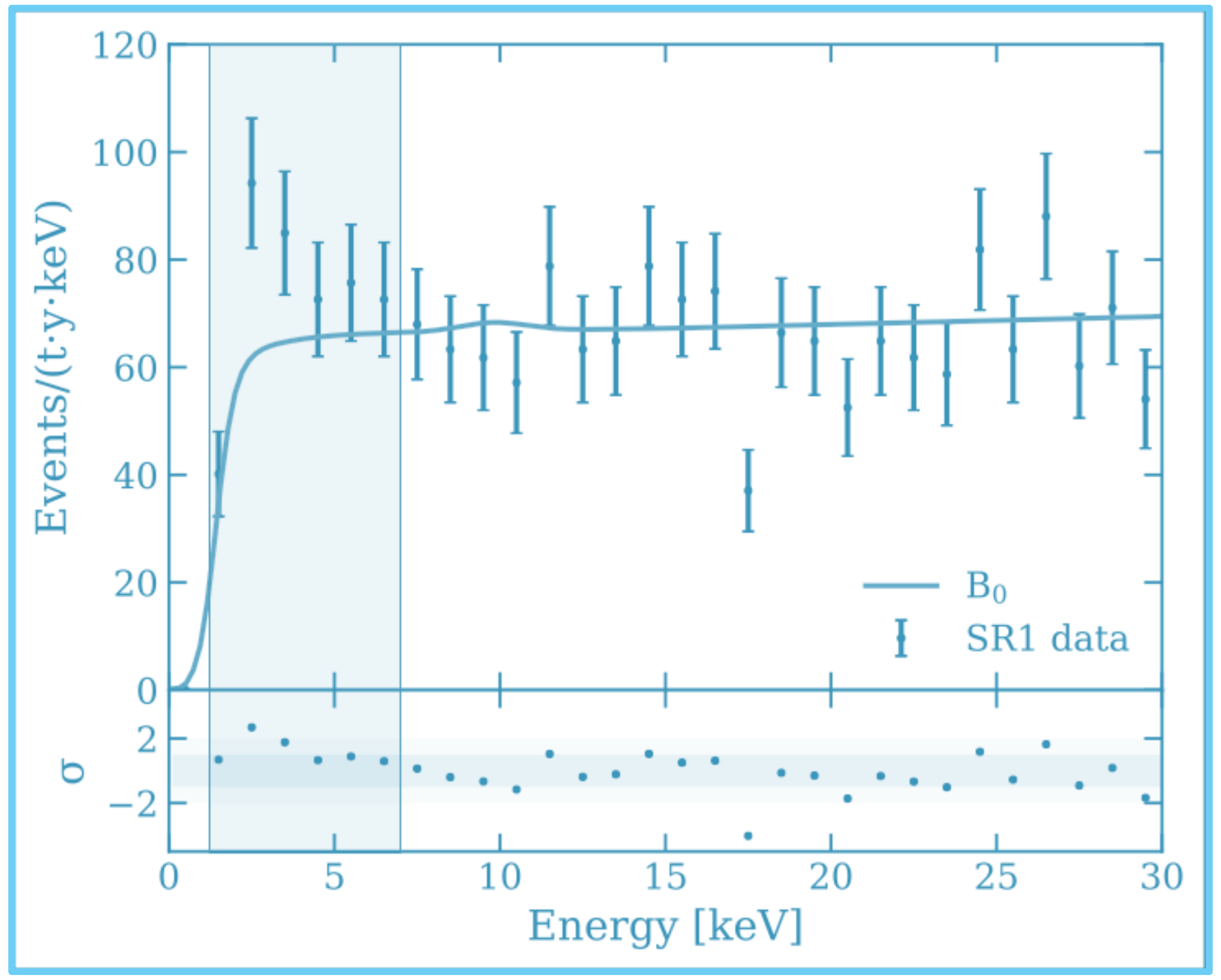
Energy reconstruction

ER/NR discrimination



Now use ultra-low ER background to search for excesses in ER band.





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

- μ_ν = [1.4, 2.9] × 10^{-11} μ_B
- μ_ν > 10^{-15} would imply neutrinos to be Majorana fermions
- Tension with astrophysical constraints

3.0σ BOSONIC DARK MATTER

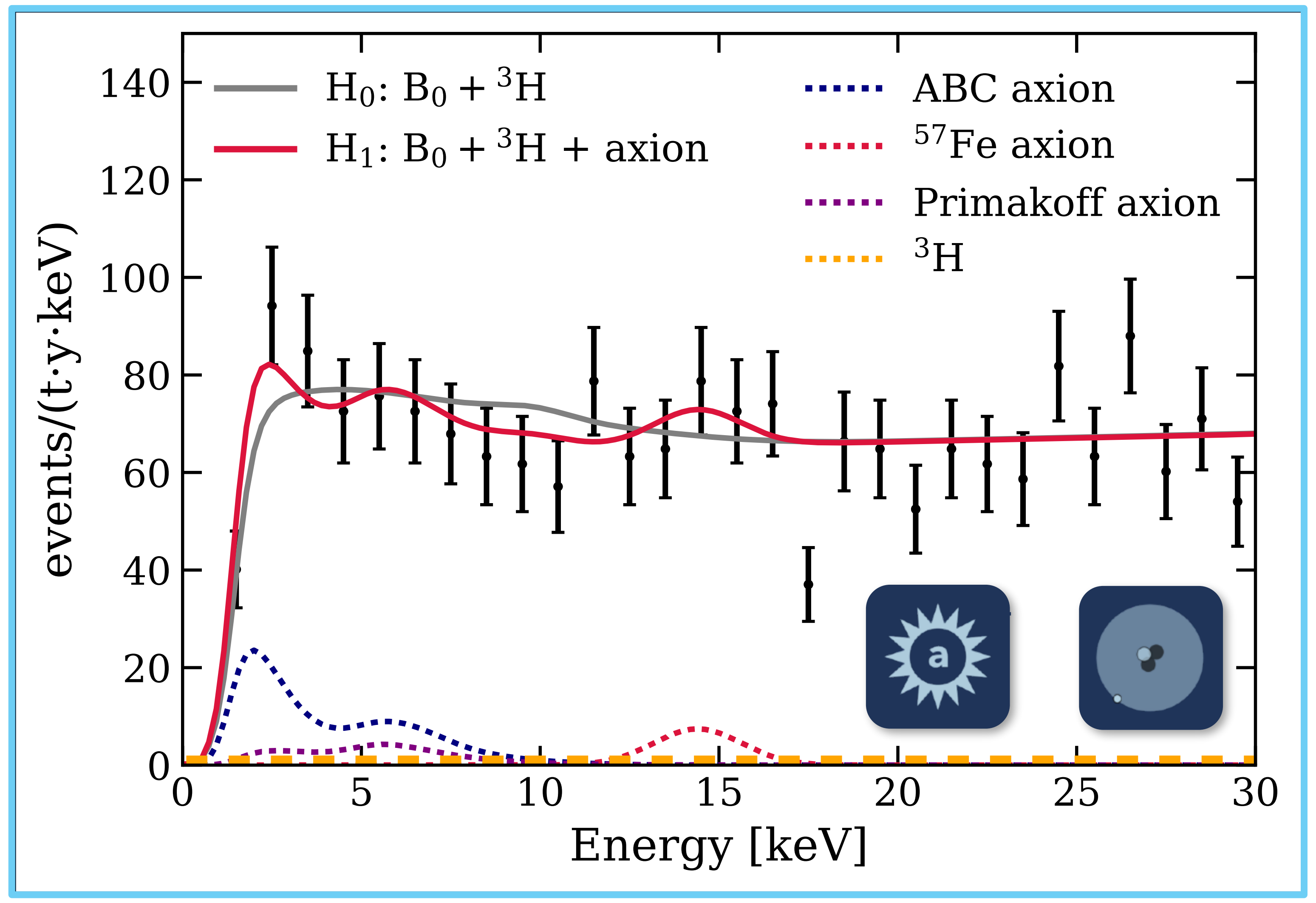
- Including pseudo-scalar (ALPS) and vector (dark photons) bosons
- Most restrictive constraints to date set

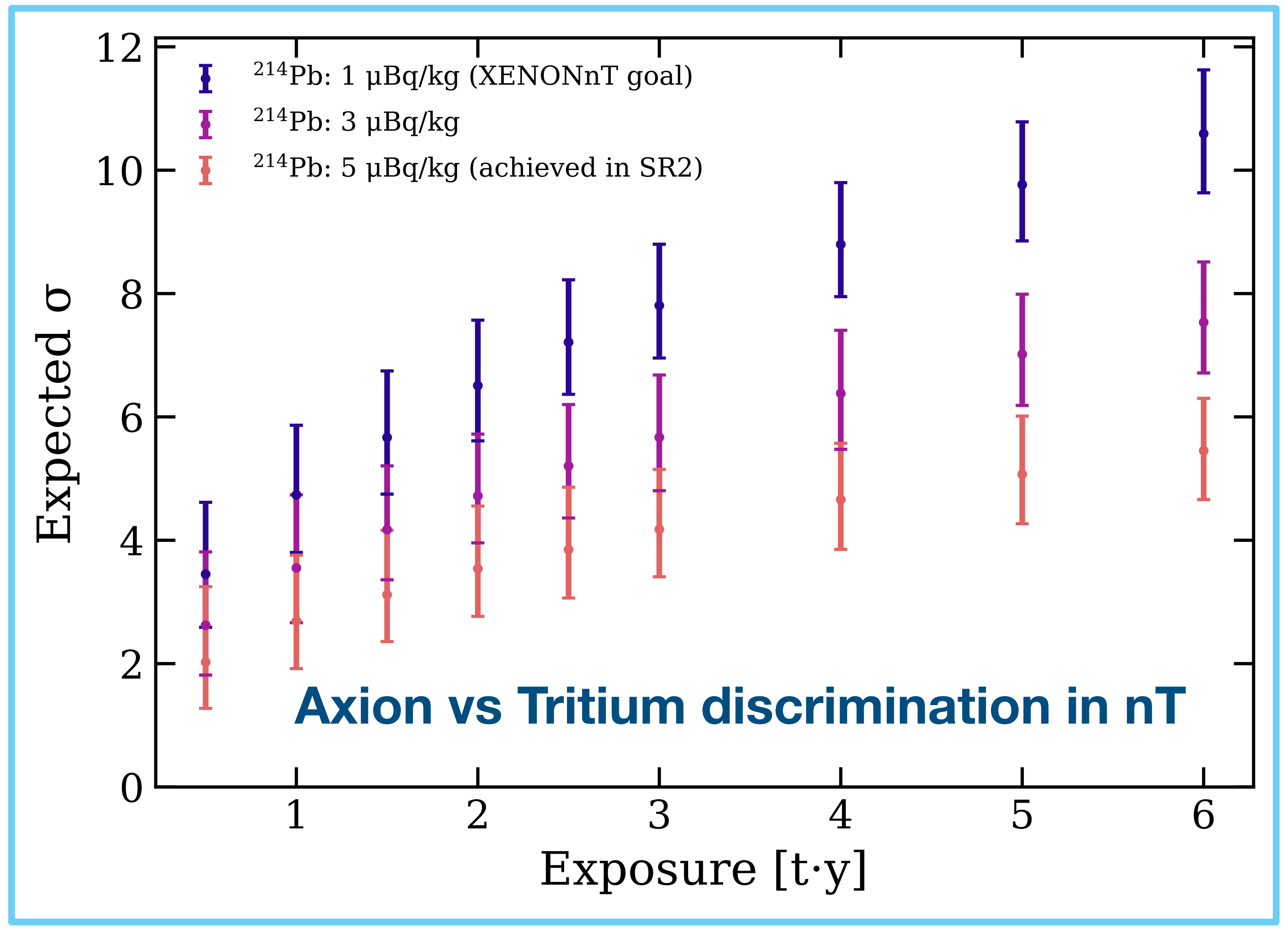
- **^{37}Ar would be removed by the online Kr distillation. The necessary air leak to explain the excess is > 13 l/year, while the upper limit from other contaminants (Kr, Rn) is 0.9 l/year**

https://arxiv.org/pdf/2112.12231.pdf

Progress of Theoretical and Experimental Physics, Volume 2022, Issue 5, May 2022, 053H01

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





Tritium background hypothesis

Marco Selvi | selvi@bo.infn.it

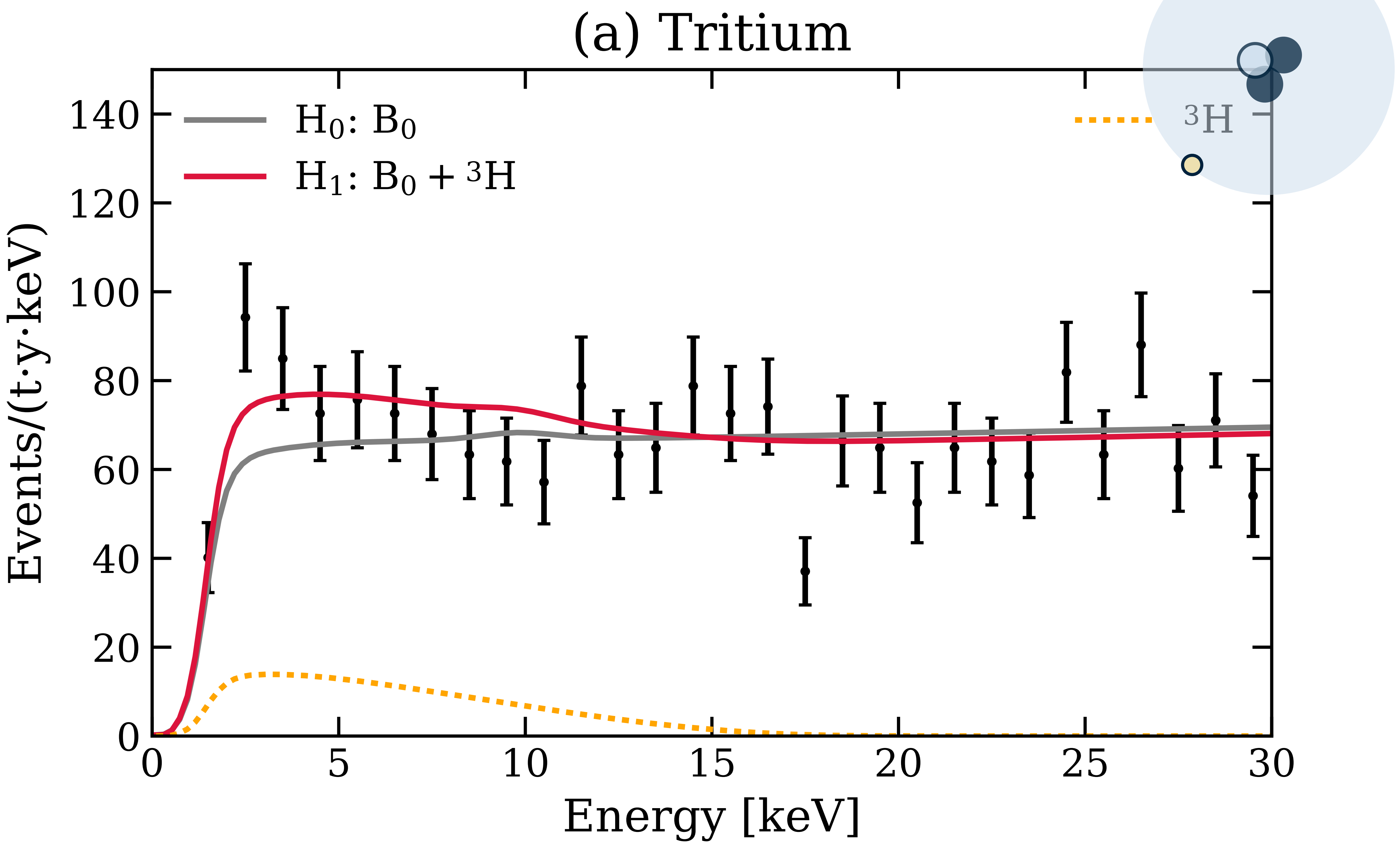
Low energy β-decay with Q-value of 18.6 keV

Long half-life of 12.3 years

Atmospherically abundant and cosmogenically produced in xenon

Removed by the continuous gas purification

Best fit: (159 ± 51) events/keV/t/yr



$$(6.2 \pm 2.0) \cdot 10^{-25}\ \frac{\text{mol}}{\text{mol}}$$

Less than three ^3H atoms per kg Xe

Tritium favored over background at 3.2σ

Tritium from natural abundance in materials

Marco Selvi | selvi@bo.infn.it

Any ^{3}H in Xe would be removed prior to filling

^{3}H could be contained within detector materials as HT (H_2) and HTO (H_2O)

Could be emanated from materials in equilibrium with online removal?

Would require **60 - 120 ppb** as the combined **$H_2O + H_2$** concentration in Xe

H_2O/Xe

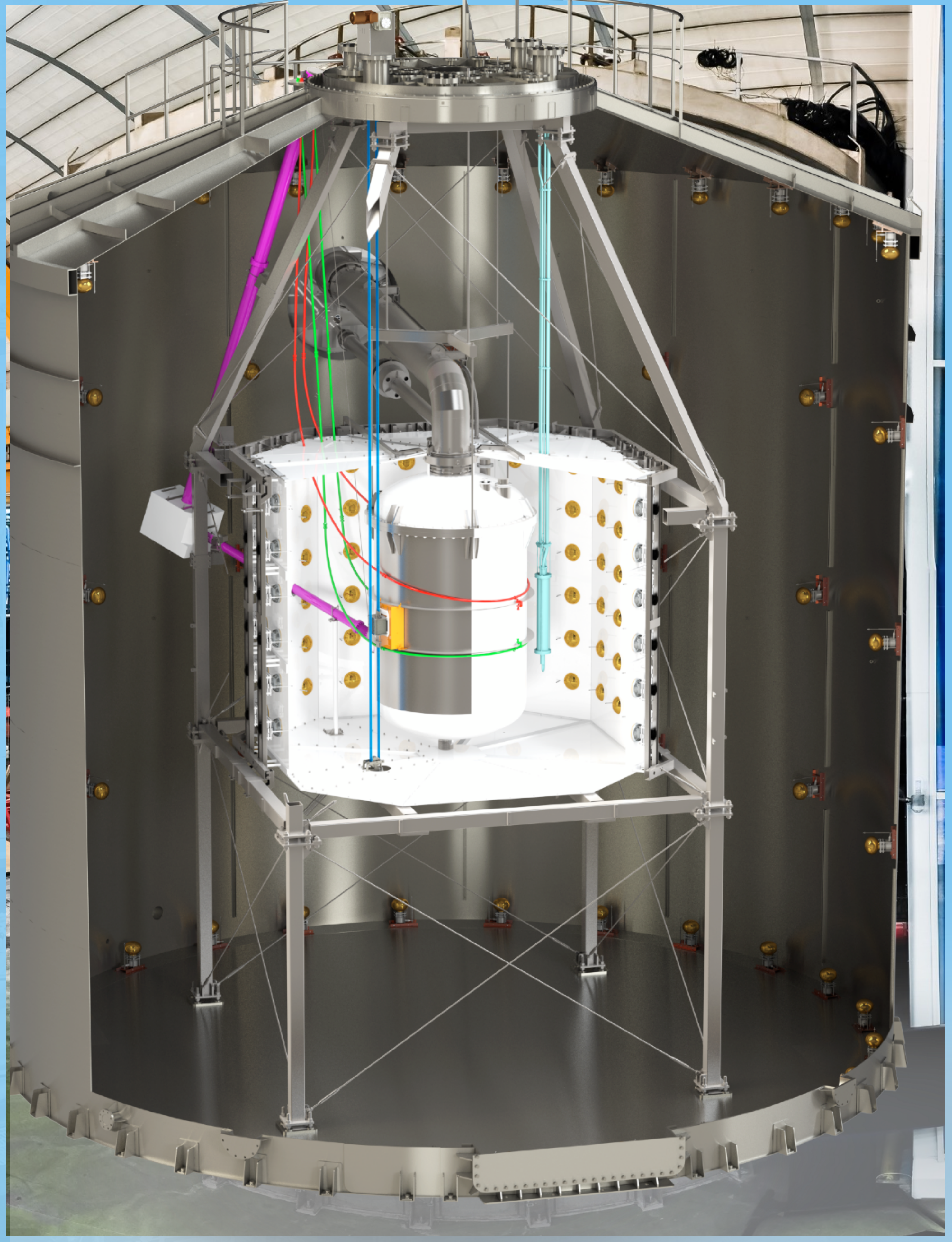
O(1) ppb from light yield measurement

H_2

Not constrained by measurement, but O_2 equivalent concentration **< ppb** from Xe purity

100 x higher emanation rate needed than for electronegative impurities

XENONnT
and its First Science Run

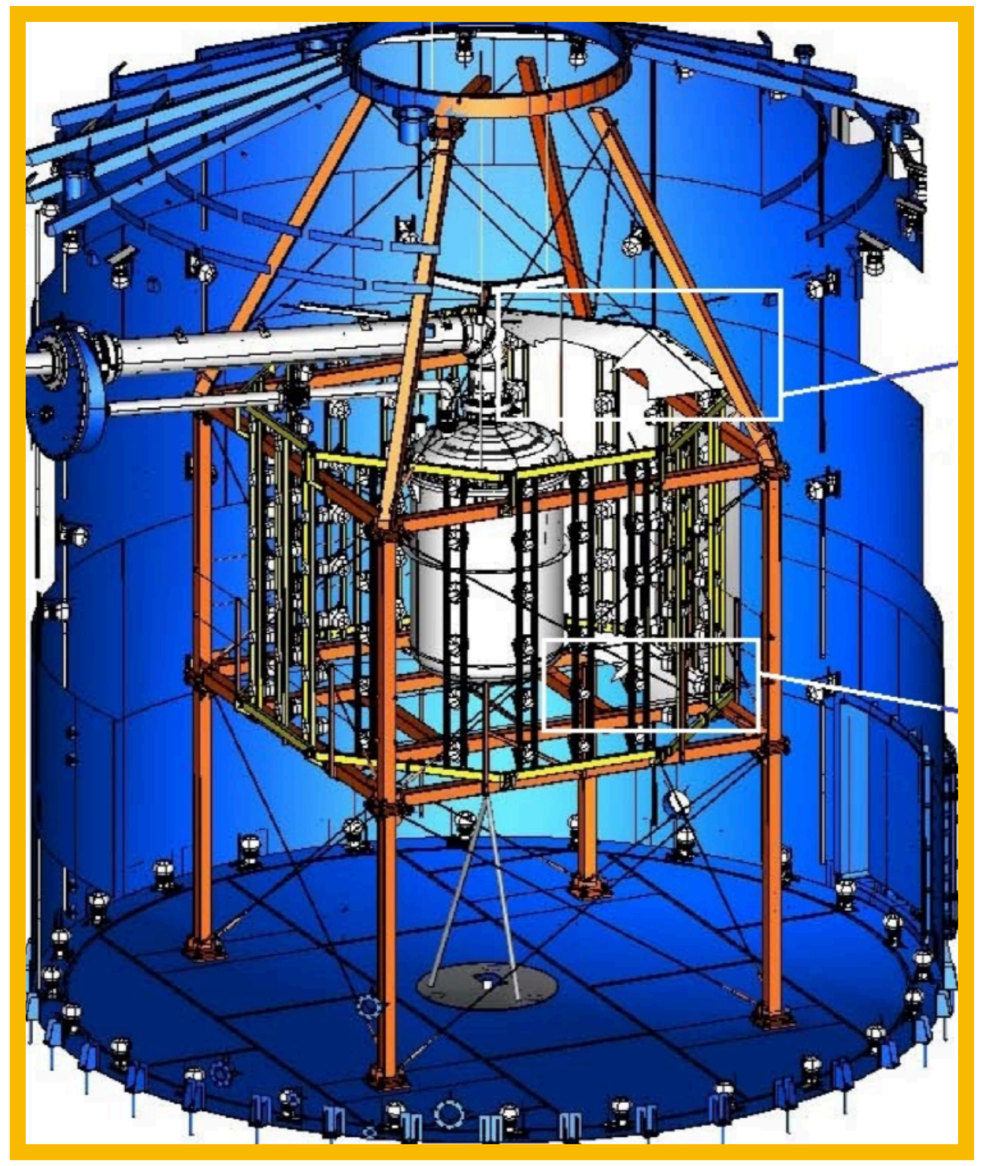


XENONnT: main upgrades

Marco Selvi | selvi@bo.infn.it

Larger TPC

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

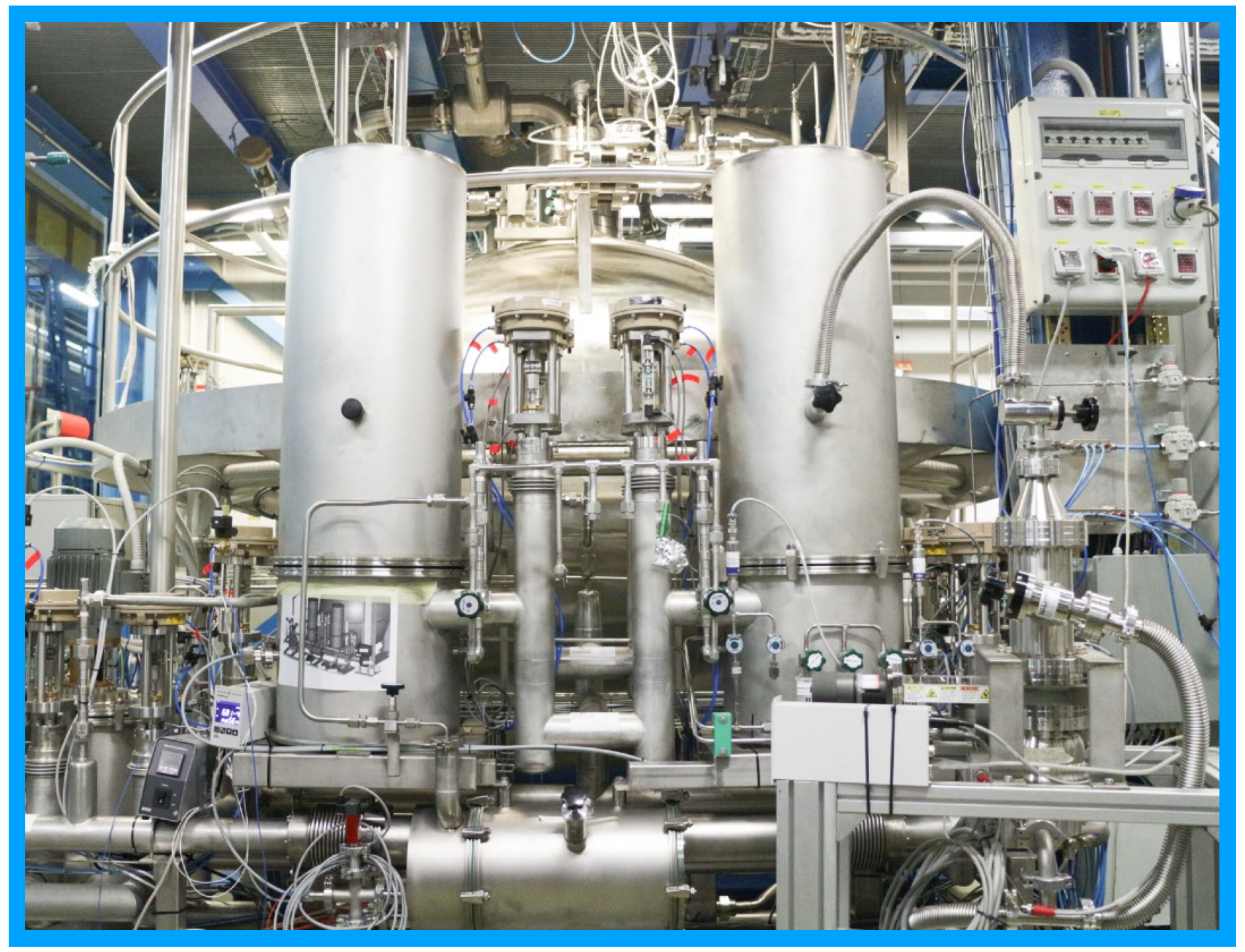


Neutron veto

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

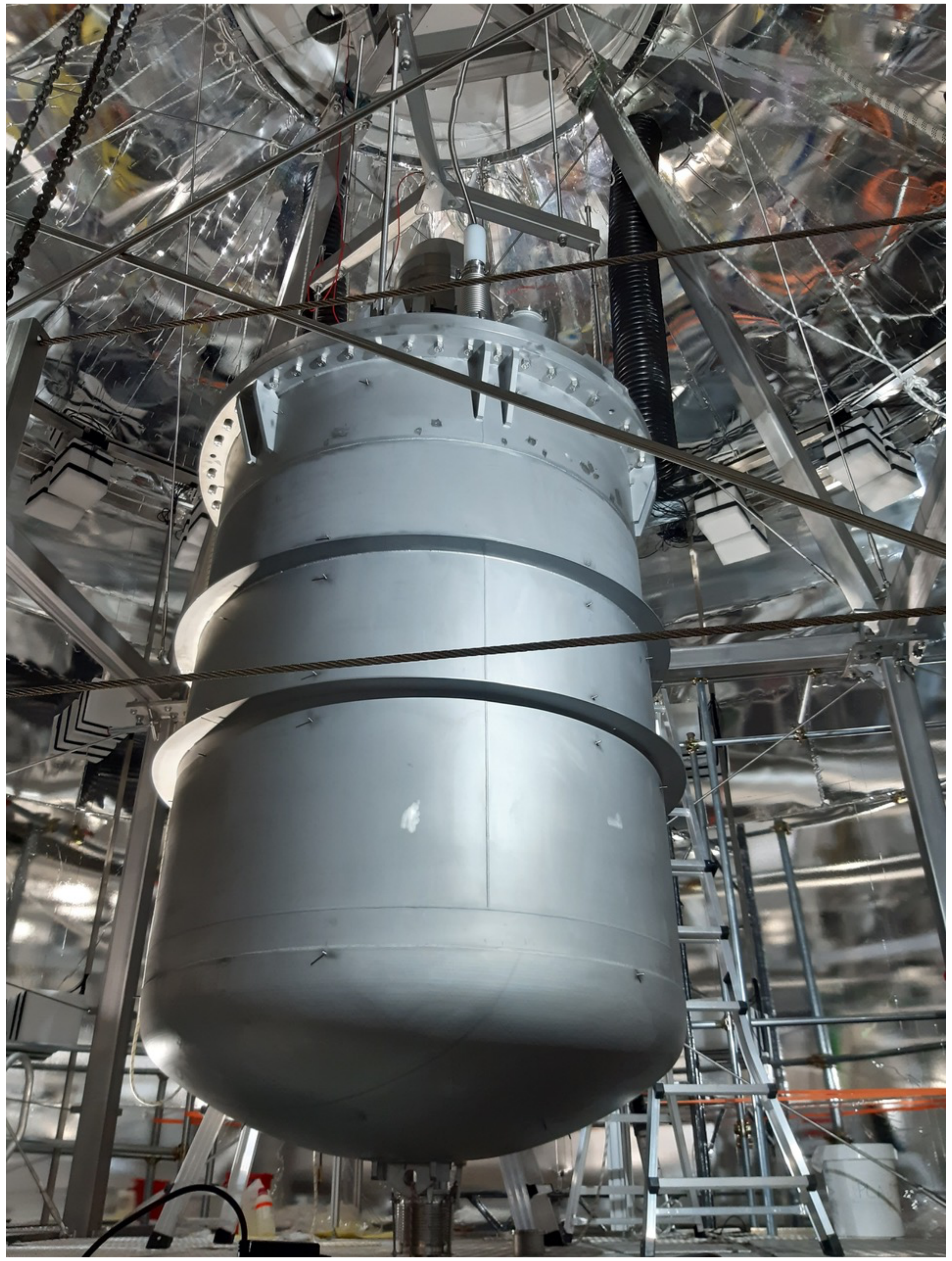
Reduce Rn (^{214}Pb) from
pipes, cables,
cryogenic system
New system,
PoP in XENON1T



LXe purification

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

Marco Selvi | selvi@bo.infn.it



March 2020
- installation of the TPC underground at LNGS, a few days before the first COVID19 lock-down

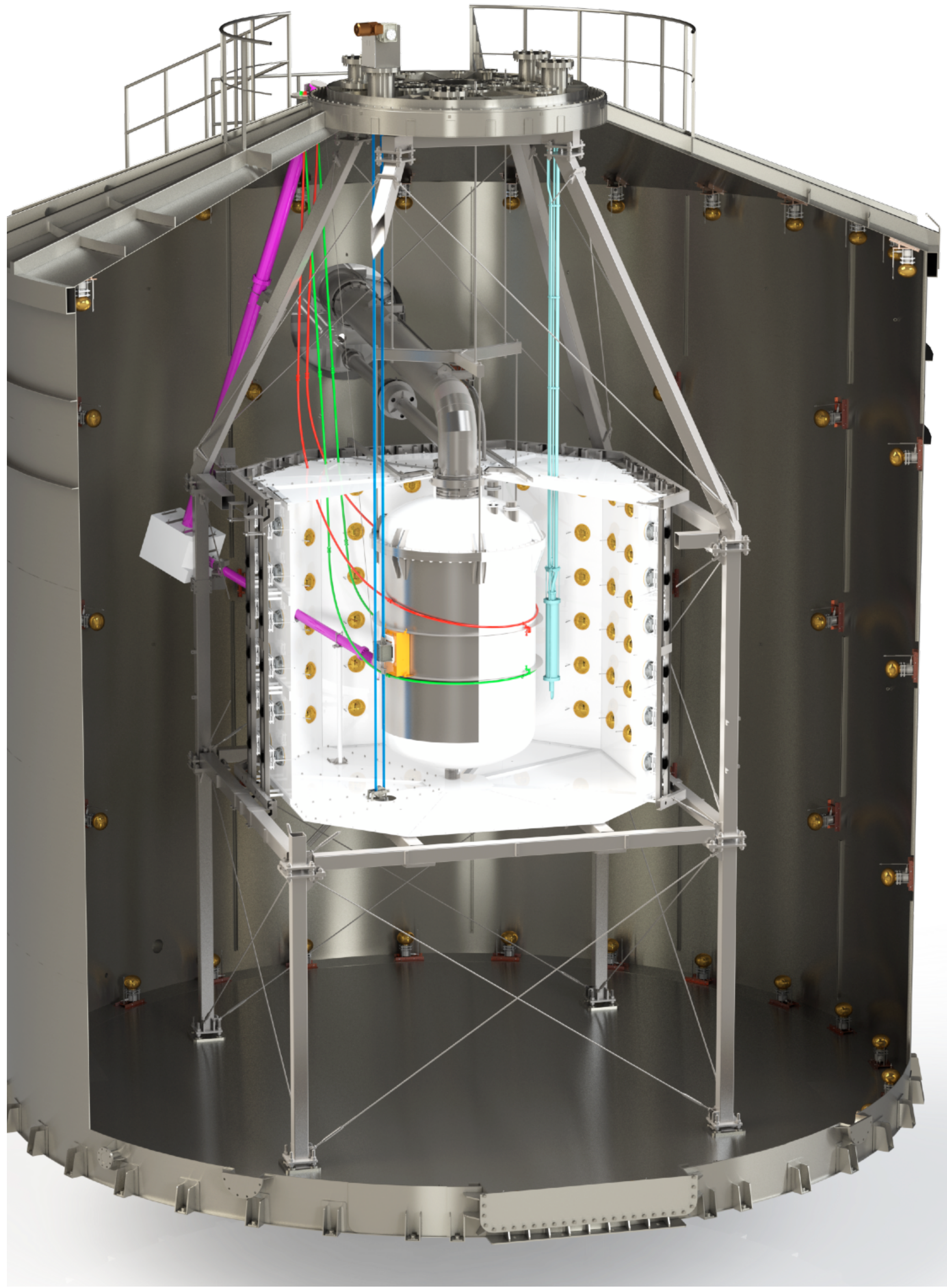
July-October 2020
Installation of the nVeto
Filling of the cryostat with LXe

December 2020
Water Tank closed and filled with demi water

January-June 2021
Commissioning, commissioning, commissioning…

July-November 2021
Science Run 0

in 2022
Refurbishment of Rn Distillation Column
Start of Science Run 1, ongoing …
In parallel: Commissioning of the GdWater purification plant

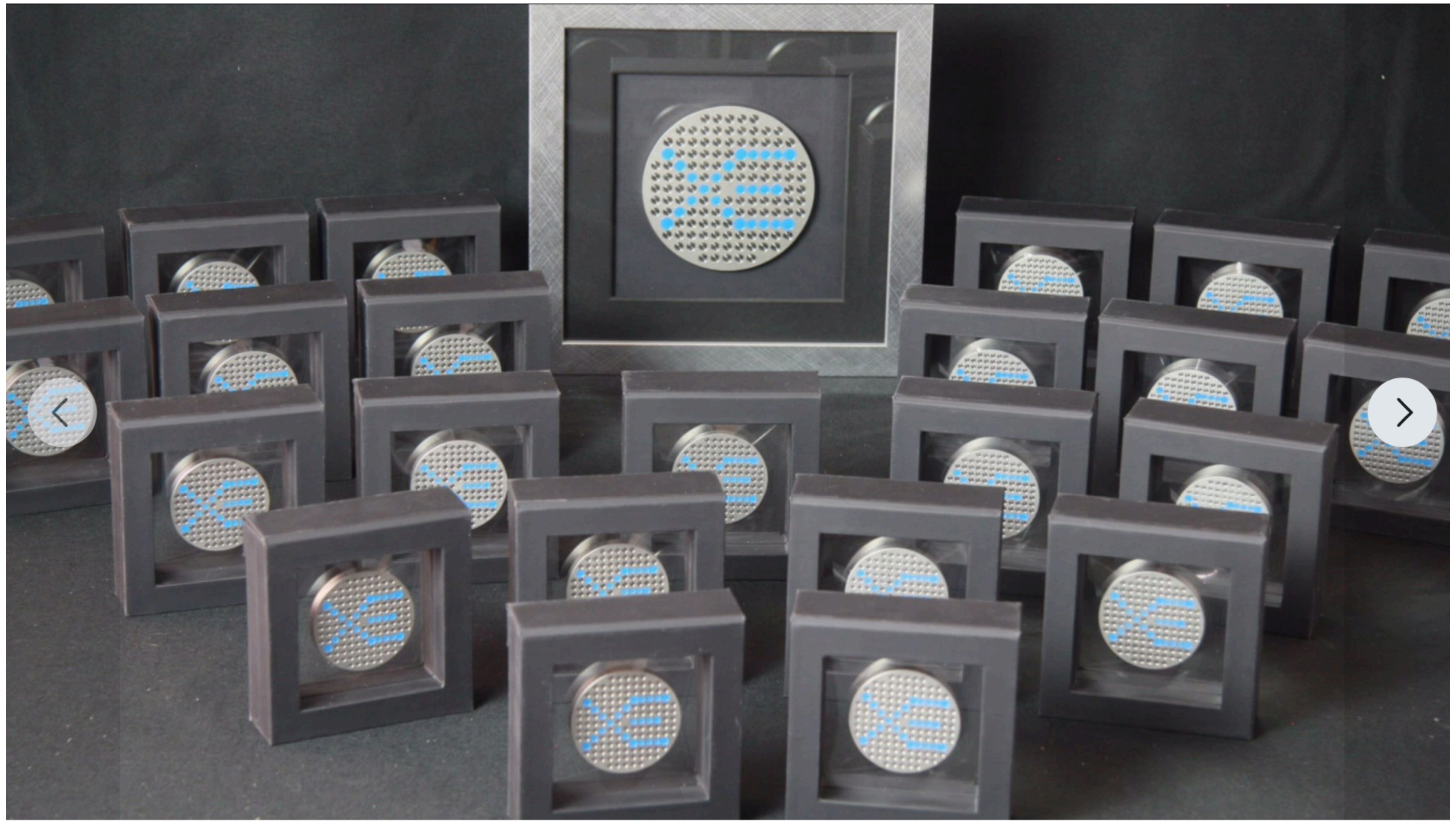


XENON award to LNGS & onsite people

Marco Selvi | selvi@bo.infn.it

XENON medal to LNGS for the support during XENONnT installation in pandemic time

…and to the 21 people who spent onsite in 2020 more time than our spokesperson Elena Aprile (2 months !)



XENONnT performances: TPC

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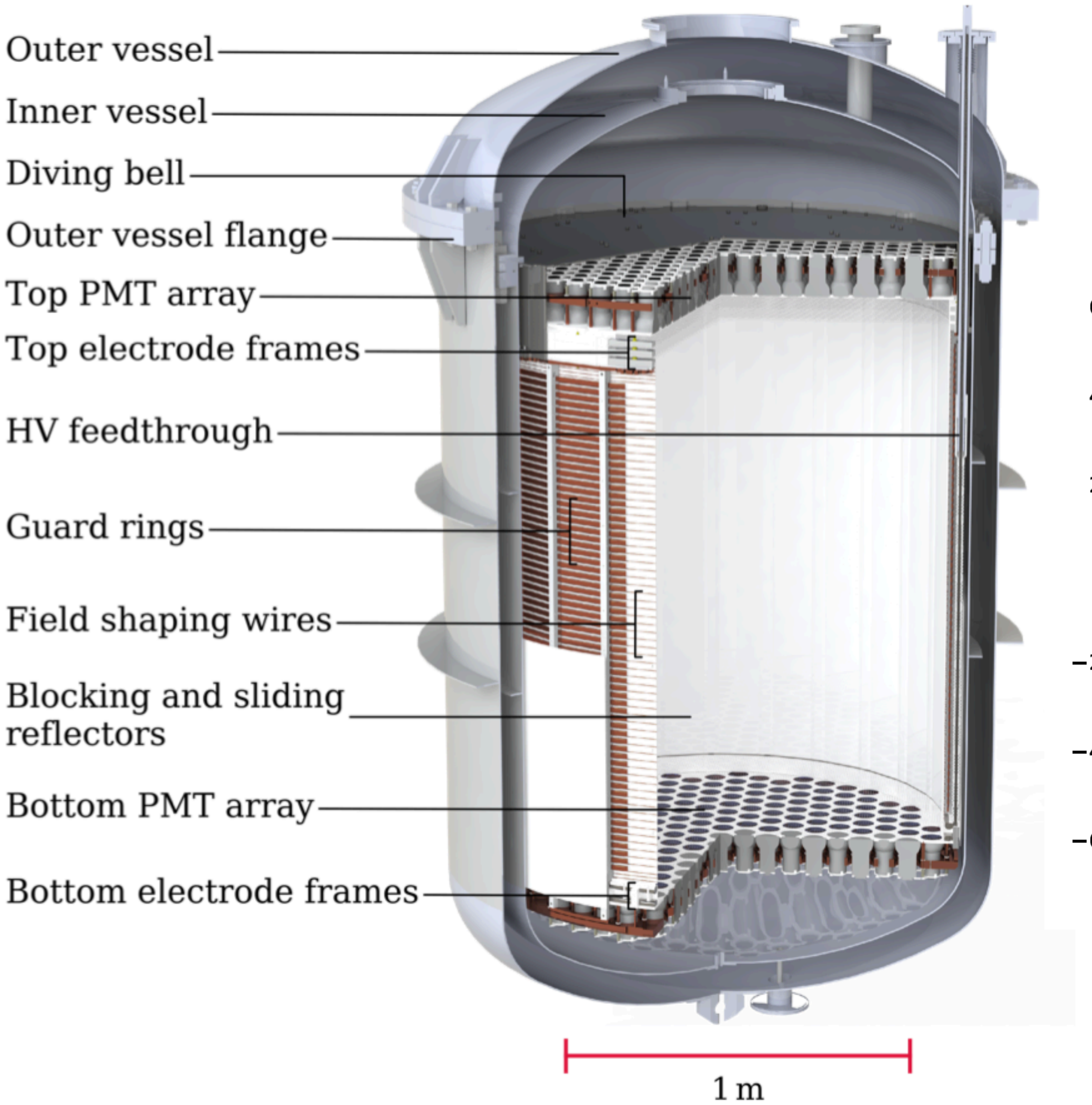
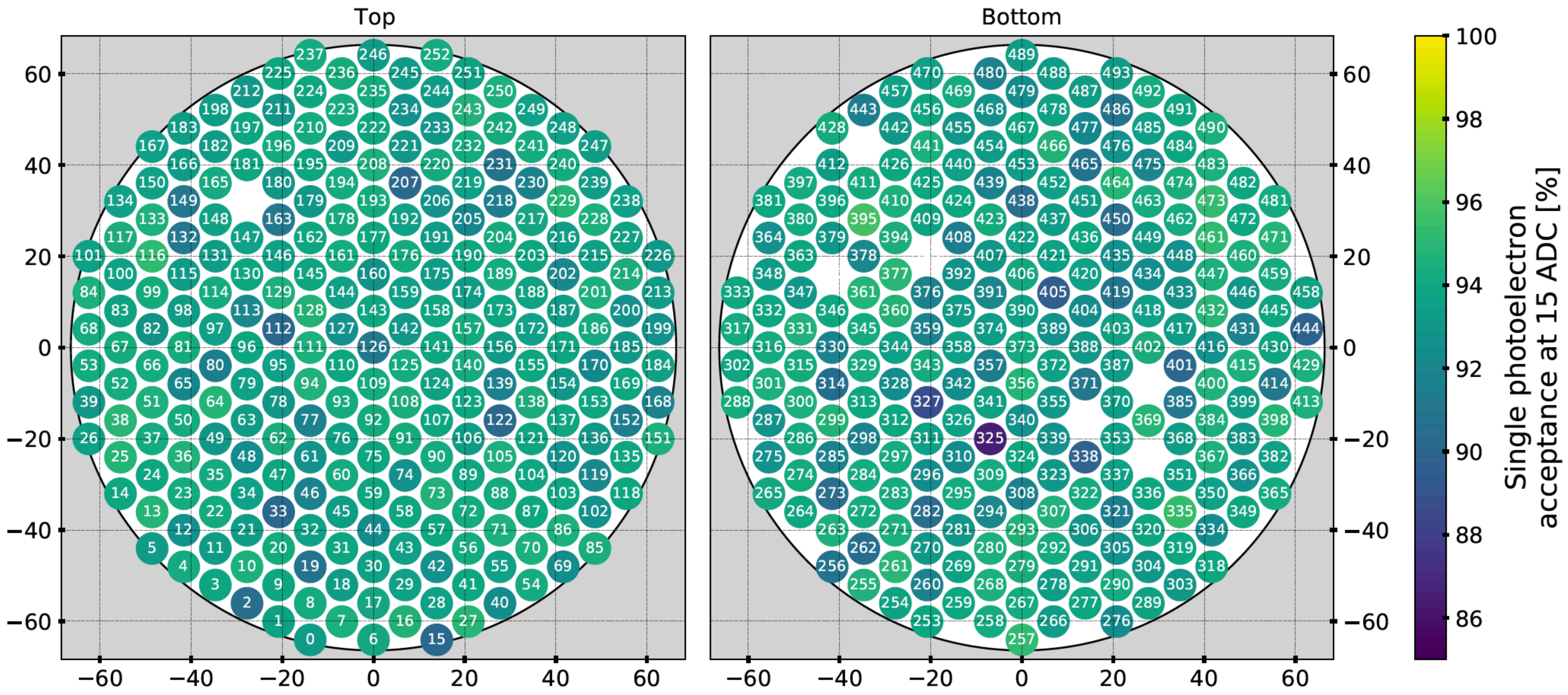
PMTs: almost all of the 494 PMTs are working very well, apart from 17.
Single PhotoElectron acceptance > 90%.





XENONnT performances: TPC

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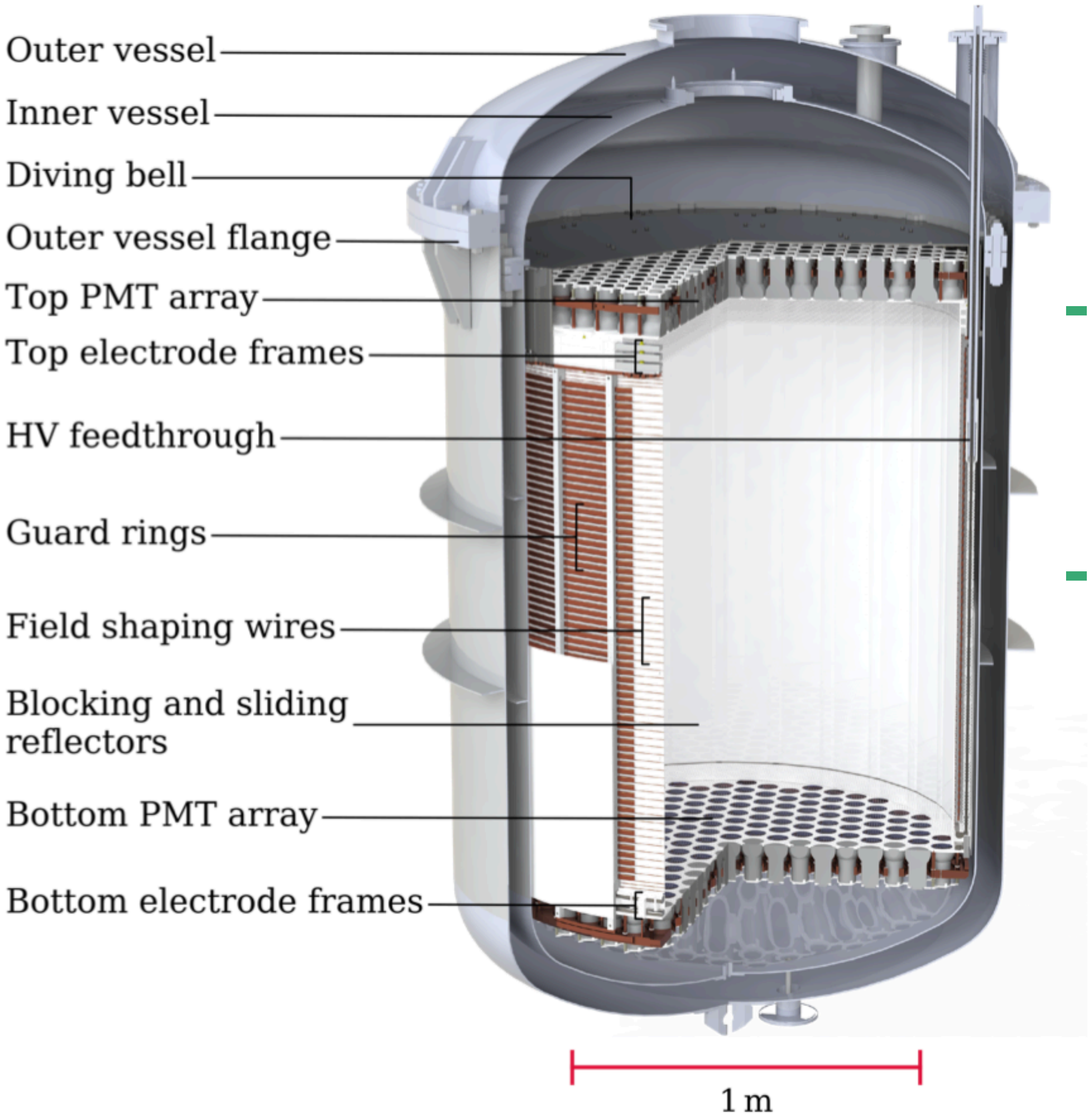
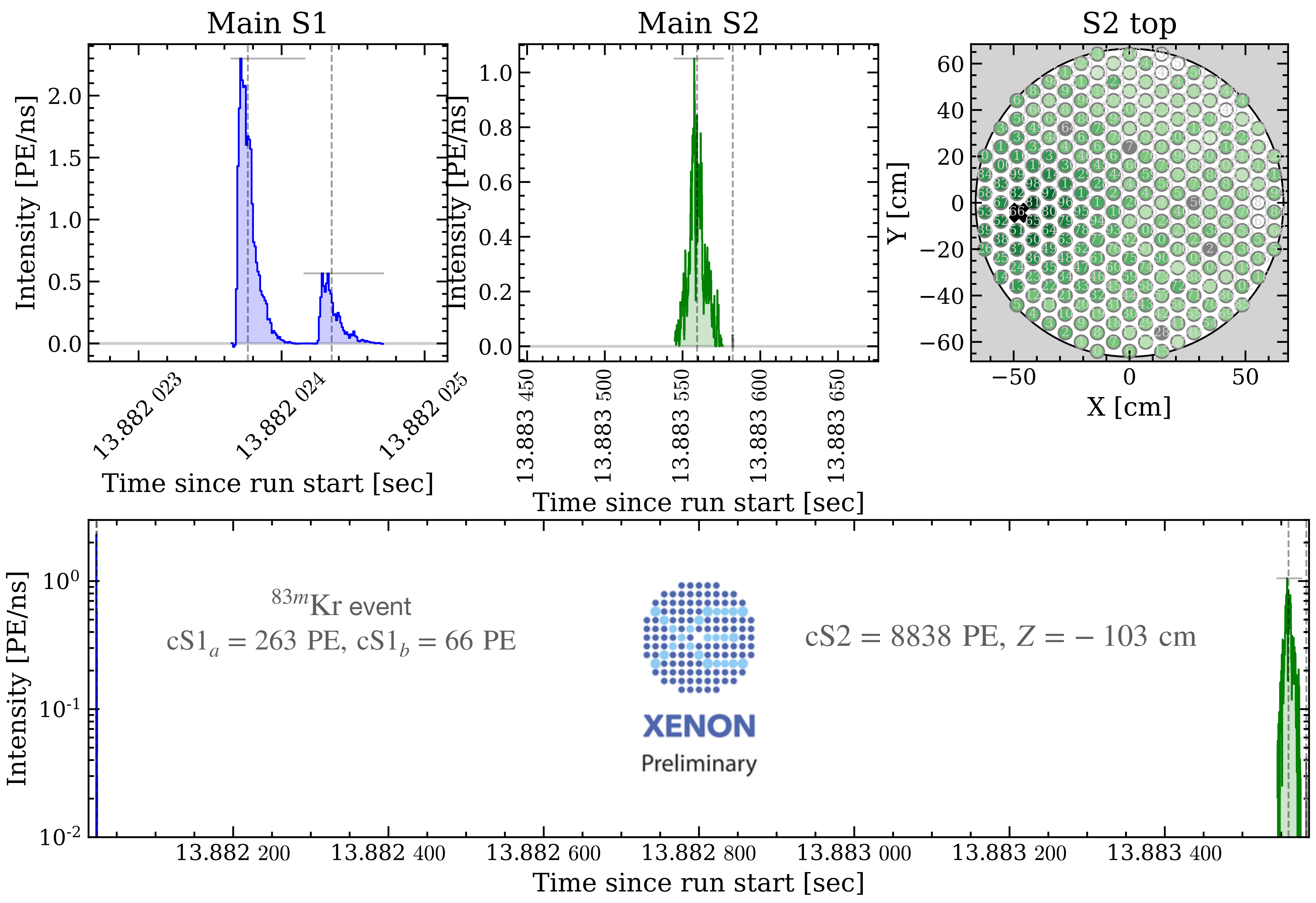


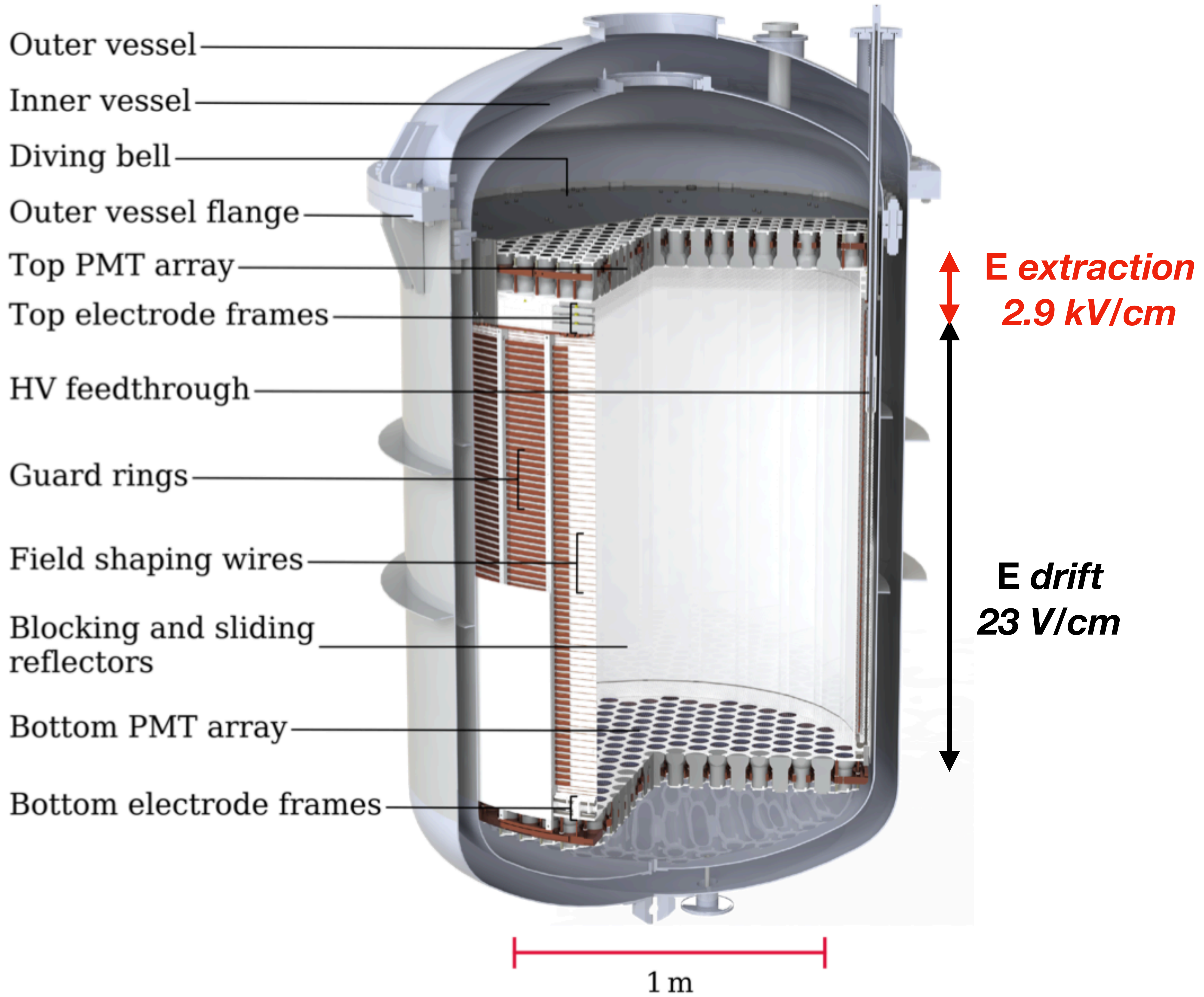
- XENON data is acquired at 100 MHz in “triggerless” mode— individual channels are read out any time they cross the threshold
- The data is reconstructed and processed with the open-source Strax+Straxen framework
- 2+ orders of magnitude faster than its XENON1T predecessors

^{83m}Kr calibration

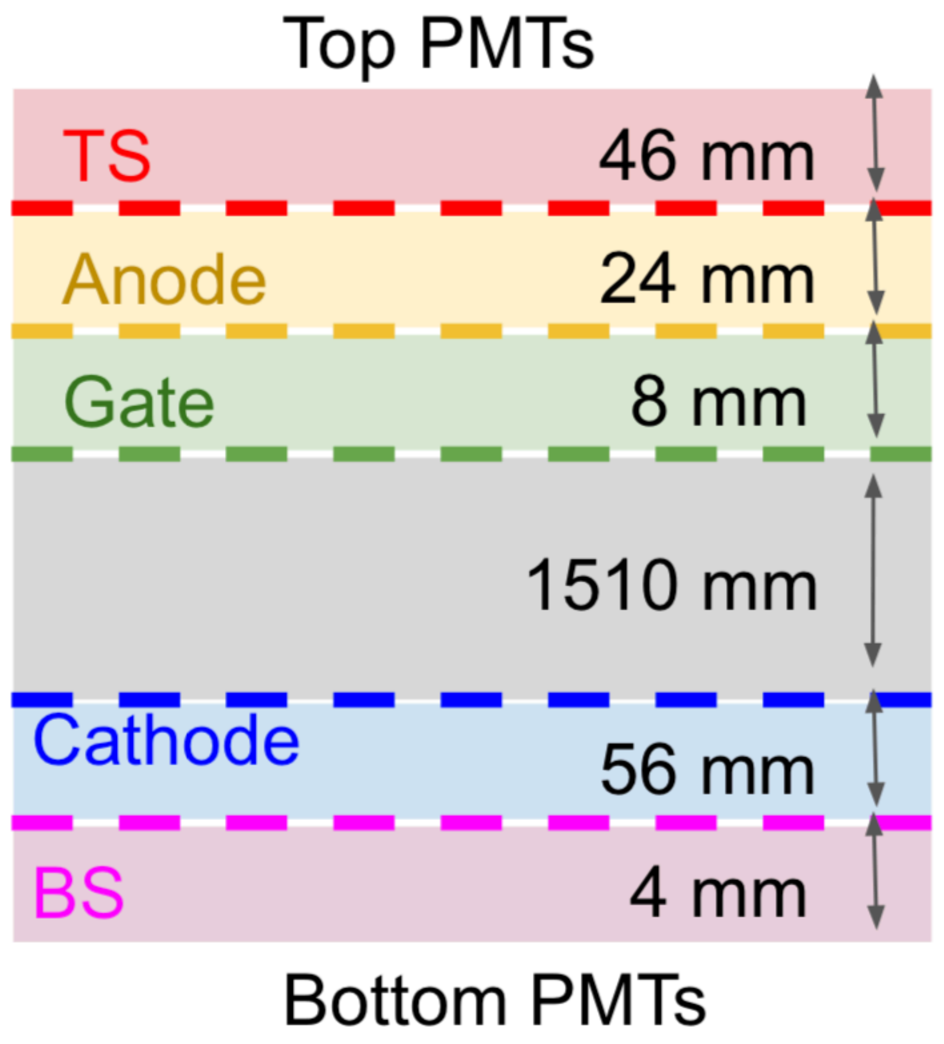


The XENON1T Data Acquisition System
JINST 14 (2019) 07, P07016

Check out Straxen at github.com/XENONnT/straxen



Issue with the electric field:
After an initial phase where we could raise the Electric drift field up to 100 V/cm (it was 80 V/cm in XENON1T), we observed a *short* between the cathode and the bottom screen electrode.



Since then, we can apply at most 23 V/cm in the TPC.

Higher light yield, but worst performances with S2.

Steps:

checked the ER/NR discrimination with AmBe

performed a first science run, dedicated to scrutiny the 1T low energy ER excess, and to WIMP search

new set of electrodes under construction

in 2023, dismount and open the detector for electrode replacement (~8-9 months needed)

XENONnT performances: TPC

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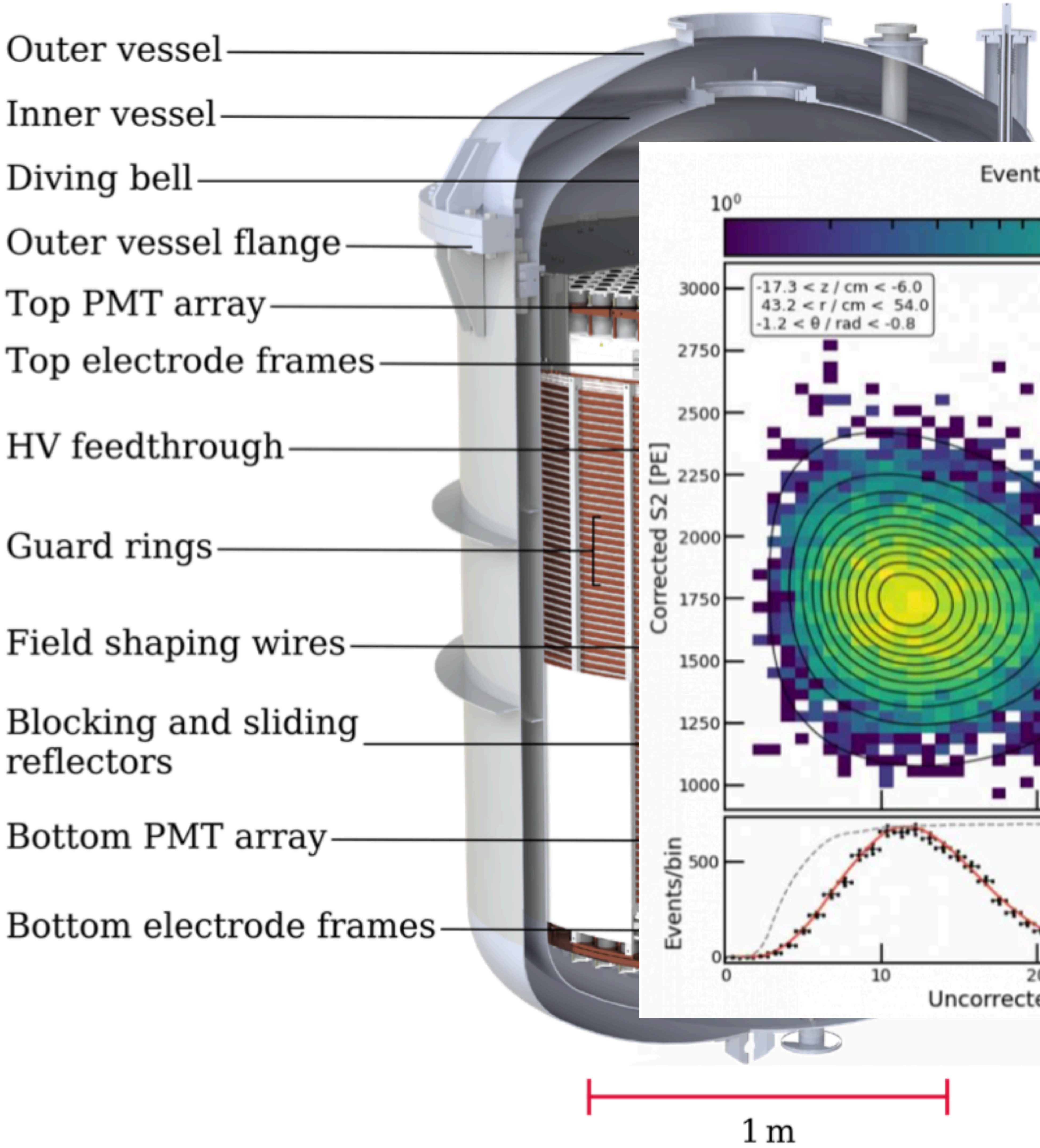
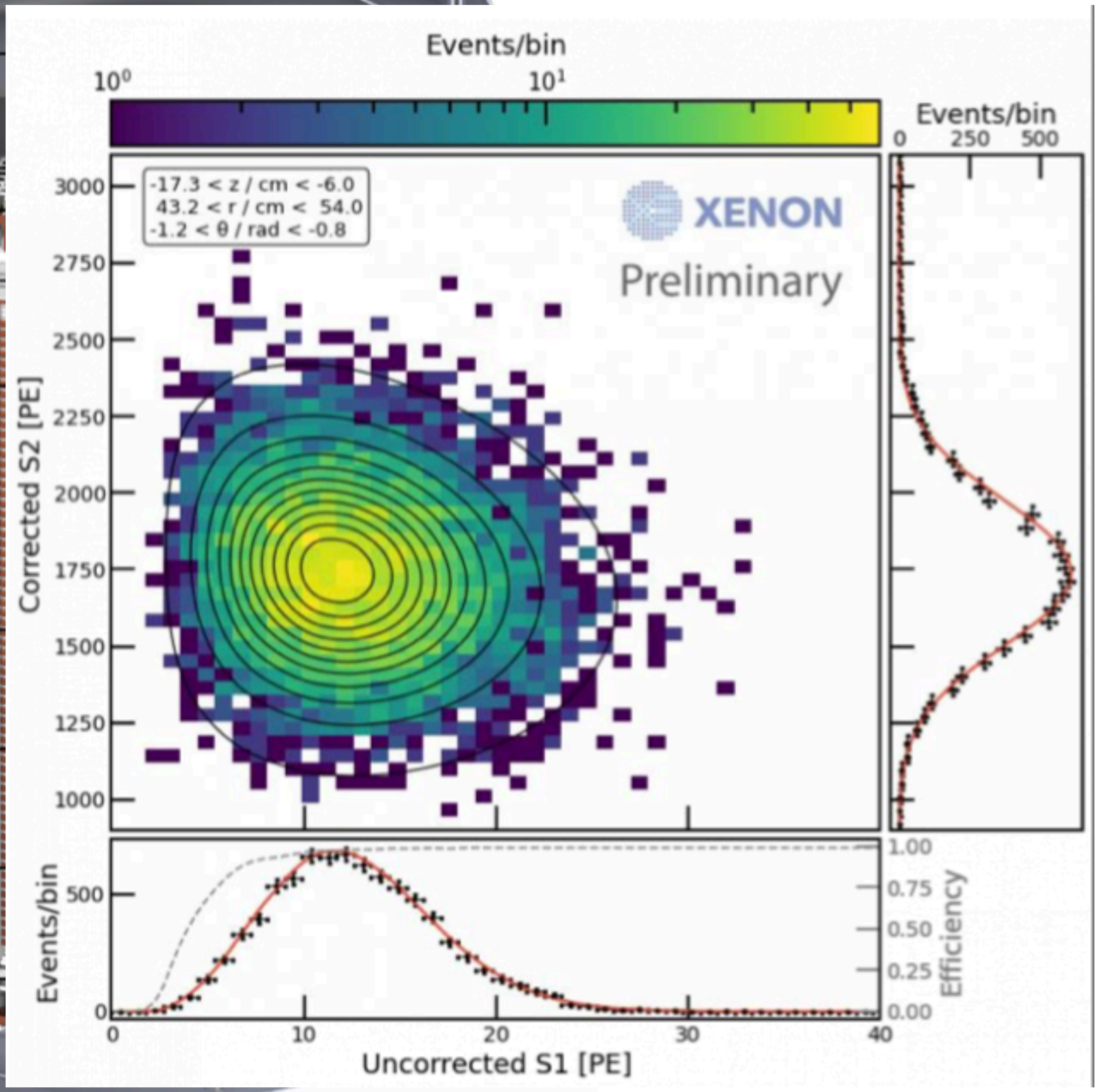
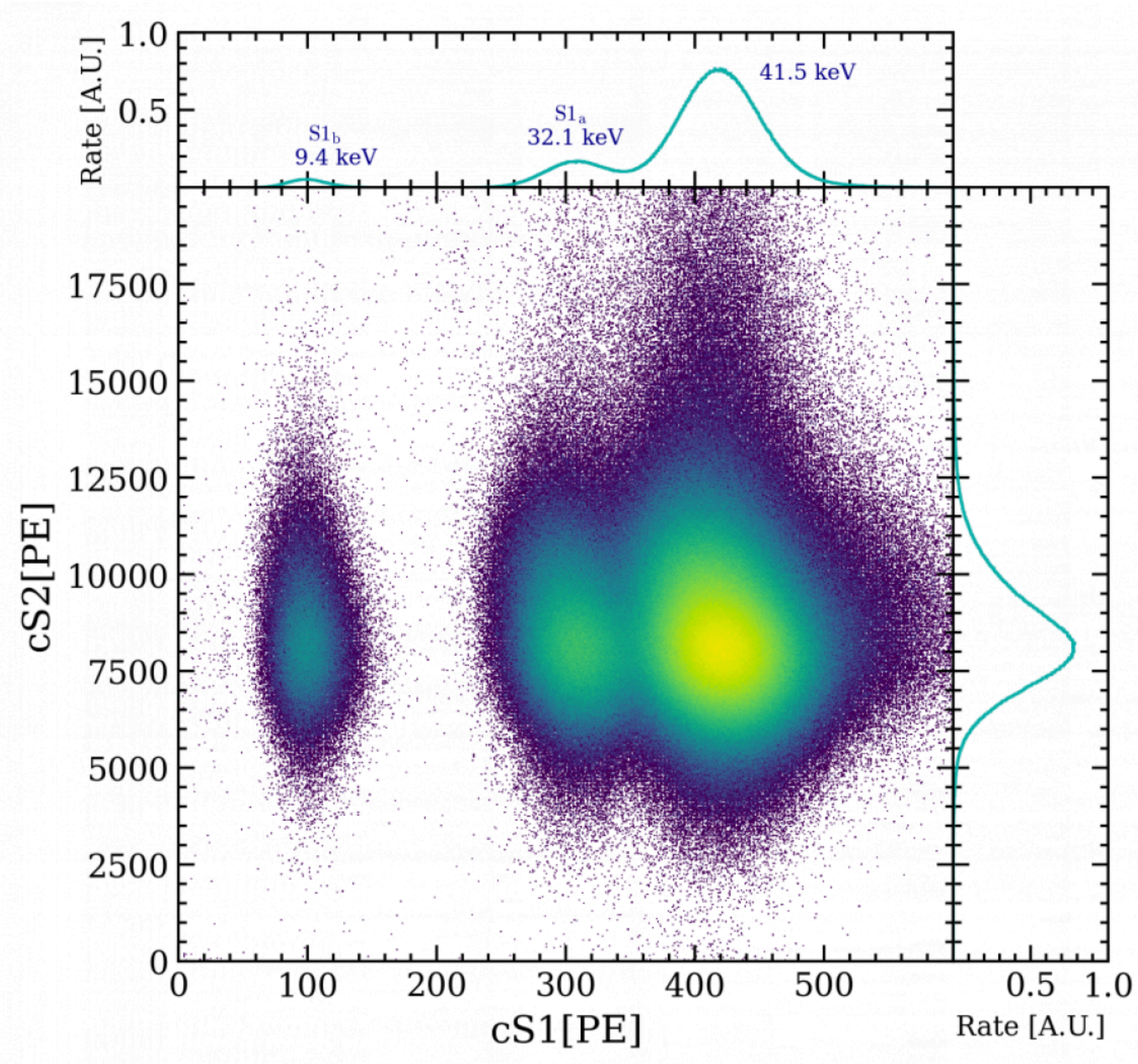


^{37}Ar calibration @23 V/cm



^{83m}Kr calibration @23 V/cm



XENONnT performances: TPC

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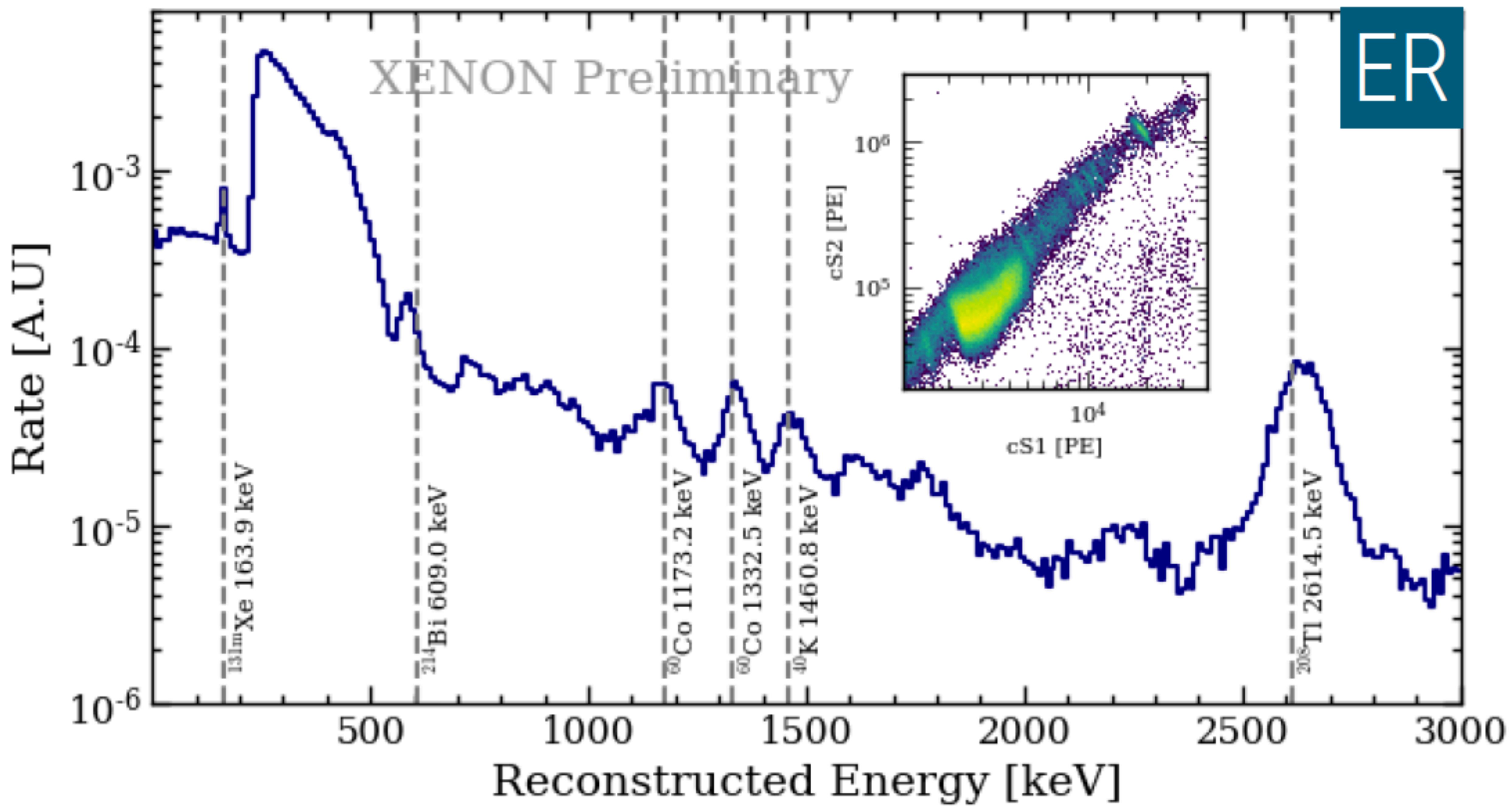
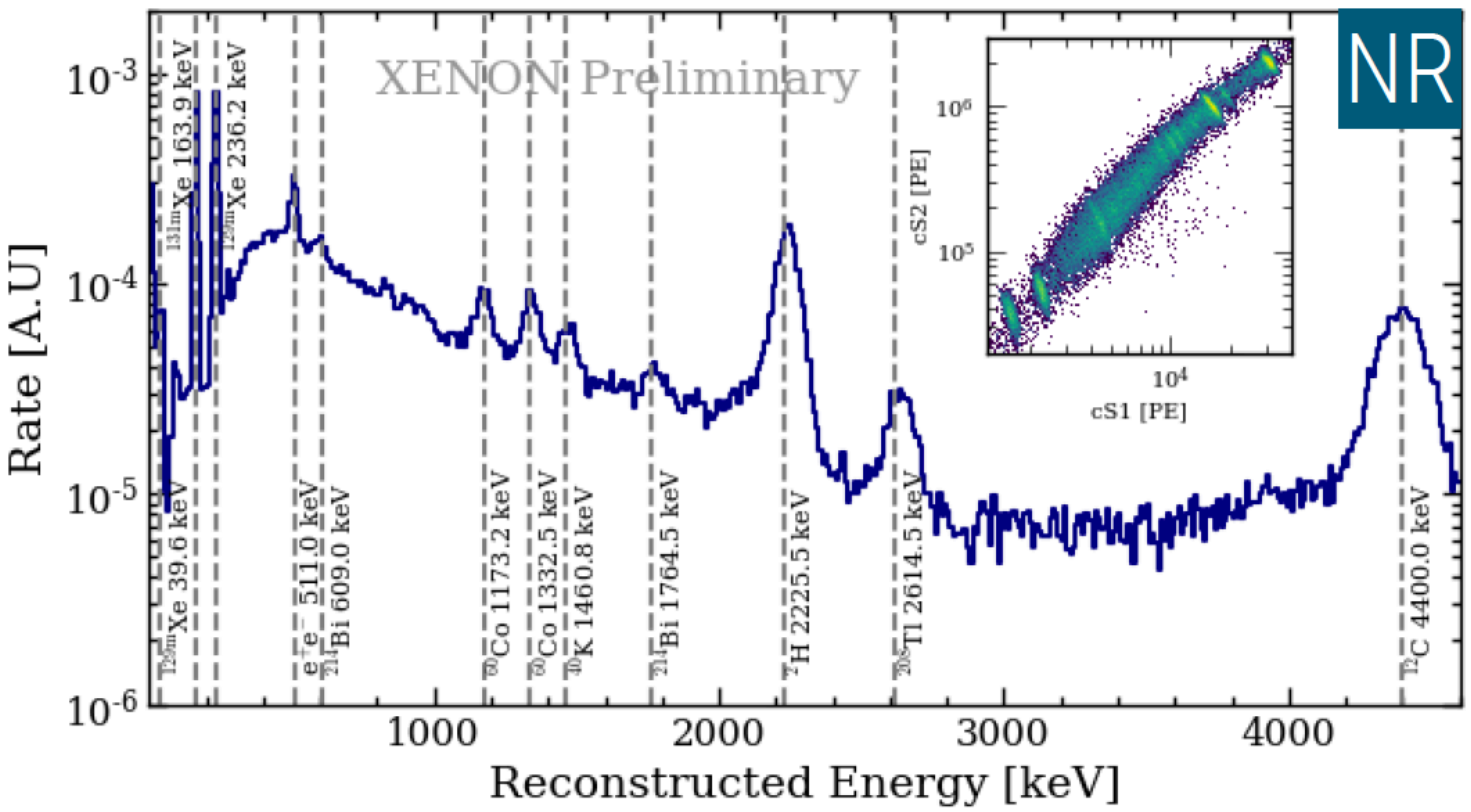
- ^{220}Rn calibration, homogenously distributed in the LXe volume, gives low-energy electronic recoil (ER) events to characterize the detector response
- AmBe source, deployed in the calibration tubes around the TPC, provides neutrons for the NR band calibration





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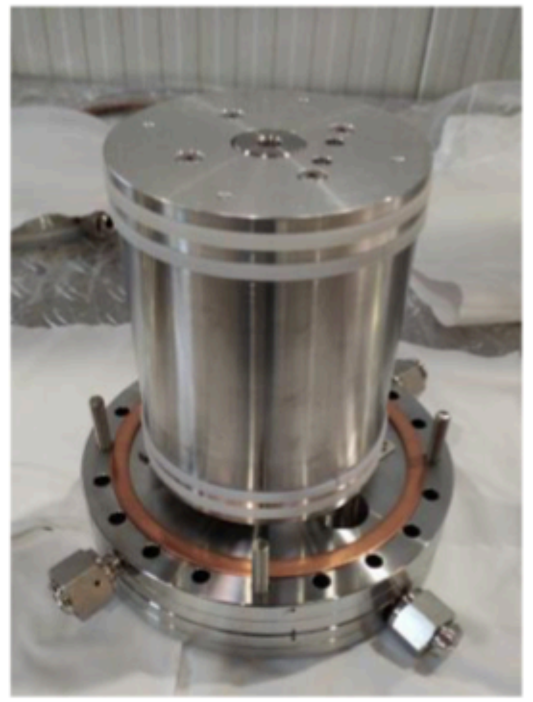
Gas purification

Magnetically-coupled piston pump for high-purity gas applications

- Magnetically coupled piston pumps
- Stable performance with a flow of 100 slpm and compression of 1.5 bar



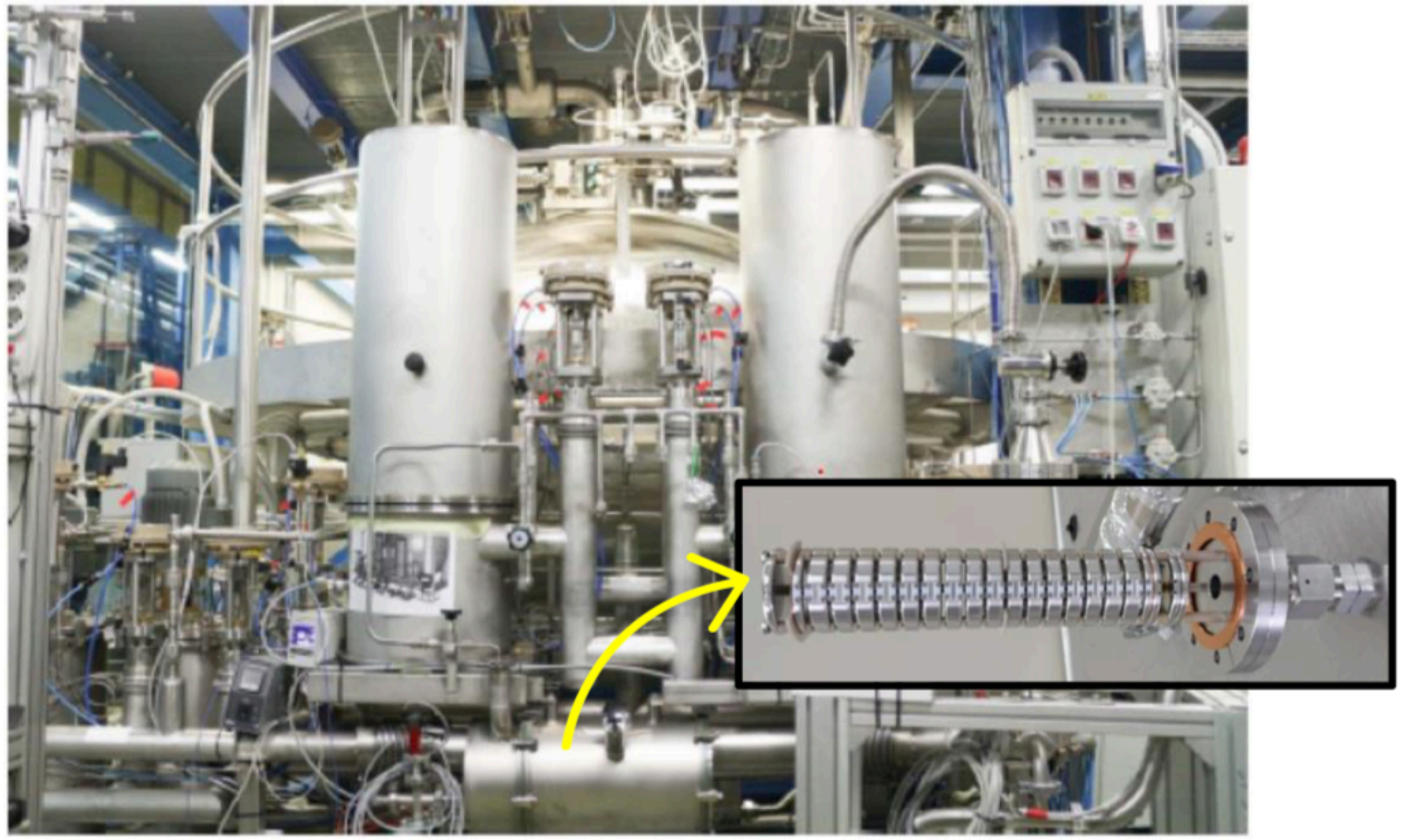
monolithic stainless-steel

Alternate polarity permanent neodymium bar magnets

Liquid purification

Liquid-phase purification for multi-tonne xenon detectors

- Novel liquid-phase purification system powered by cryogenic pumps
- Copper-impregnated spheres (Q5) for intense purification and ST707 pills filter for data taking period



XENONnT performances: Cryogenics &Purification

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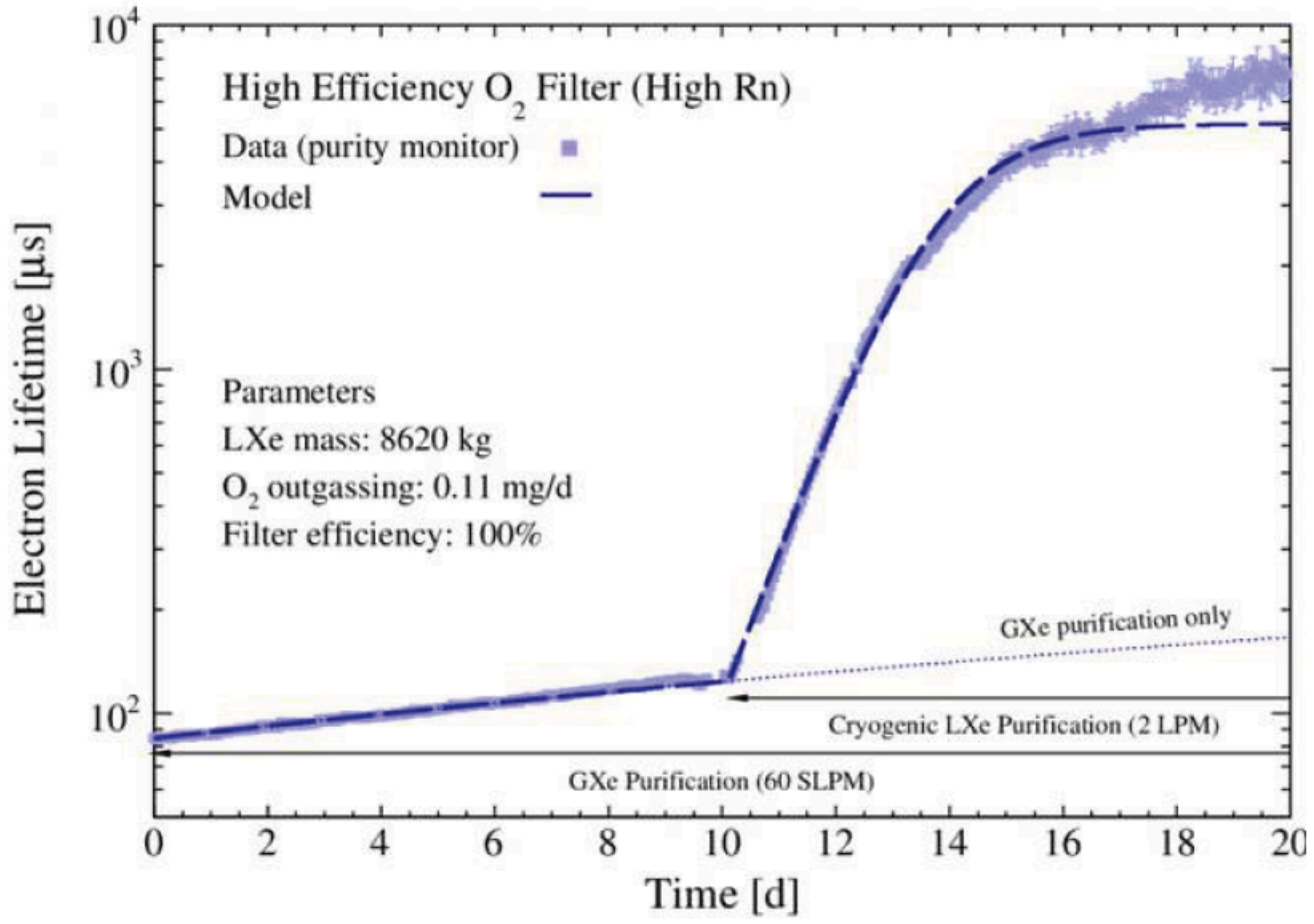

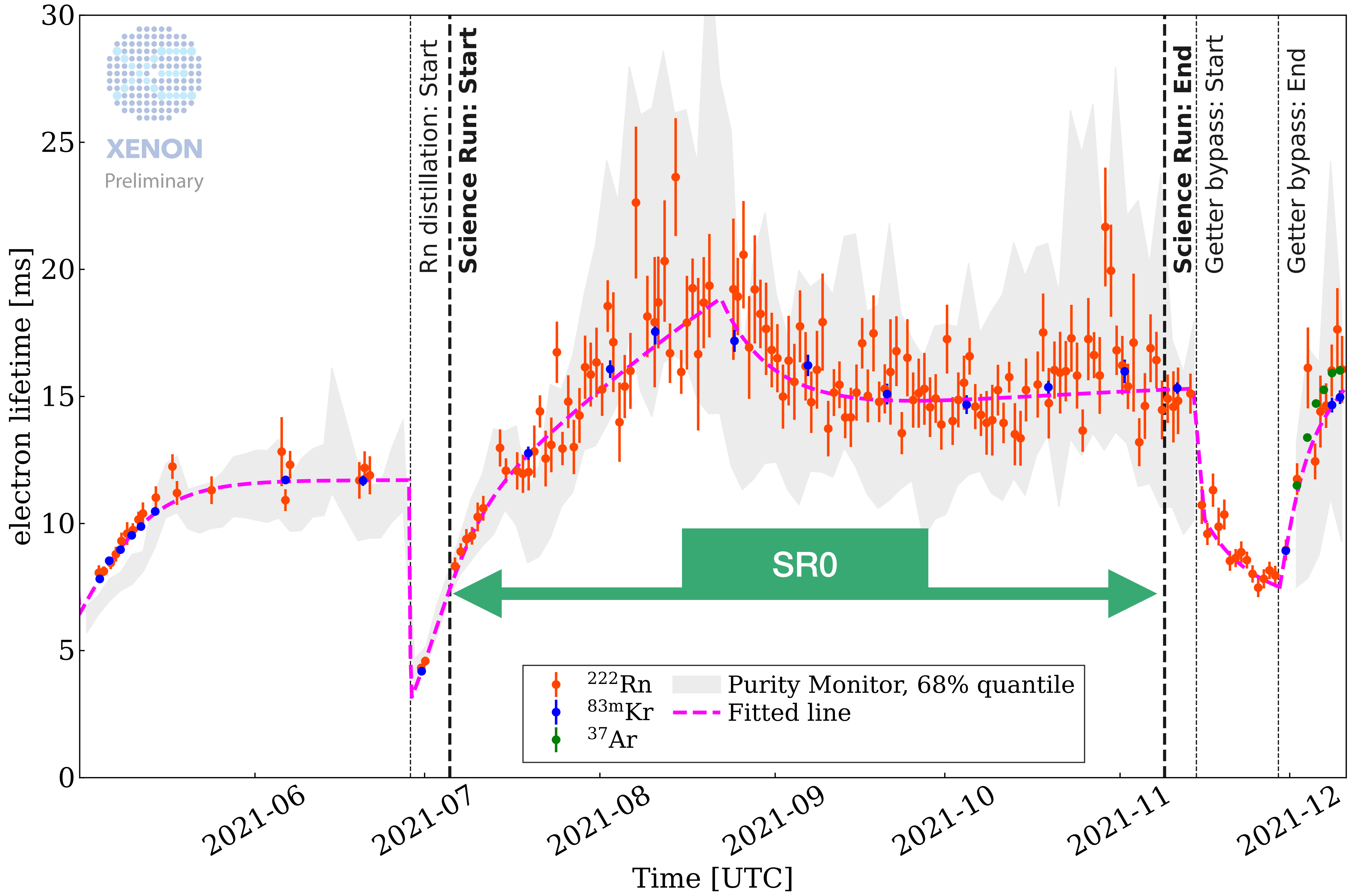

XENON1T

- 0.6 ms in SR1 (0.9 × Δ*t* max)
- 1 ms after pump upgrade in SR2 (1.4 × Δ*t* max)

	Full TPC drift time	electron lifetime	electrons surviving a full drift length
XENON1T	0.67 ms	0.65 ms	30%
XENONnT	2.2 ms	10+ ms	86 % @ 15 ms

- High-flux purification (around 350 kg/h)
- Electron lifetime from 100 µs to 5 ms within 5 days (0.65 ms in XENON1T)
- e-lifetime during SRO > 10 ms

XENONnT performances: Rn distillation

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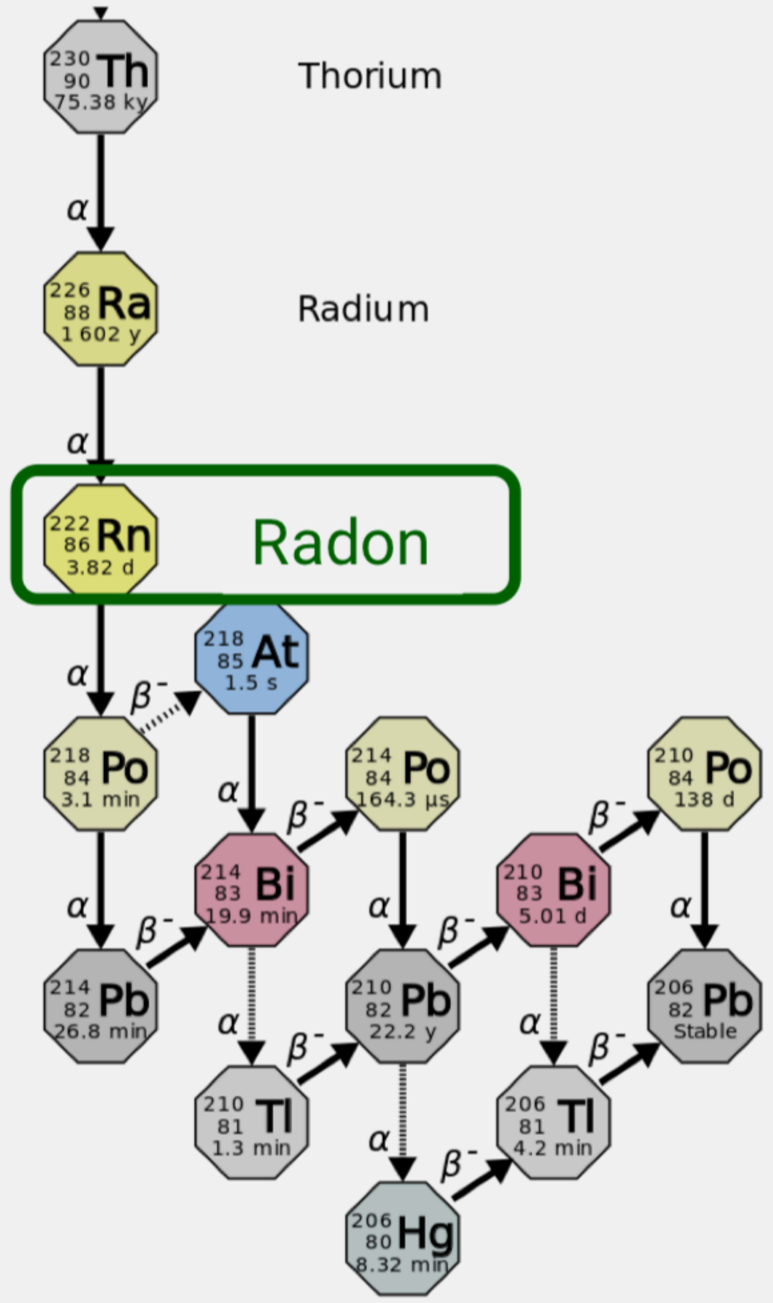
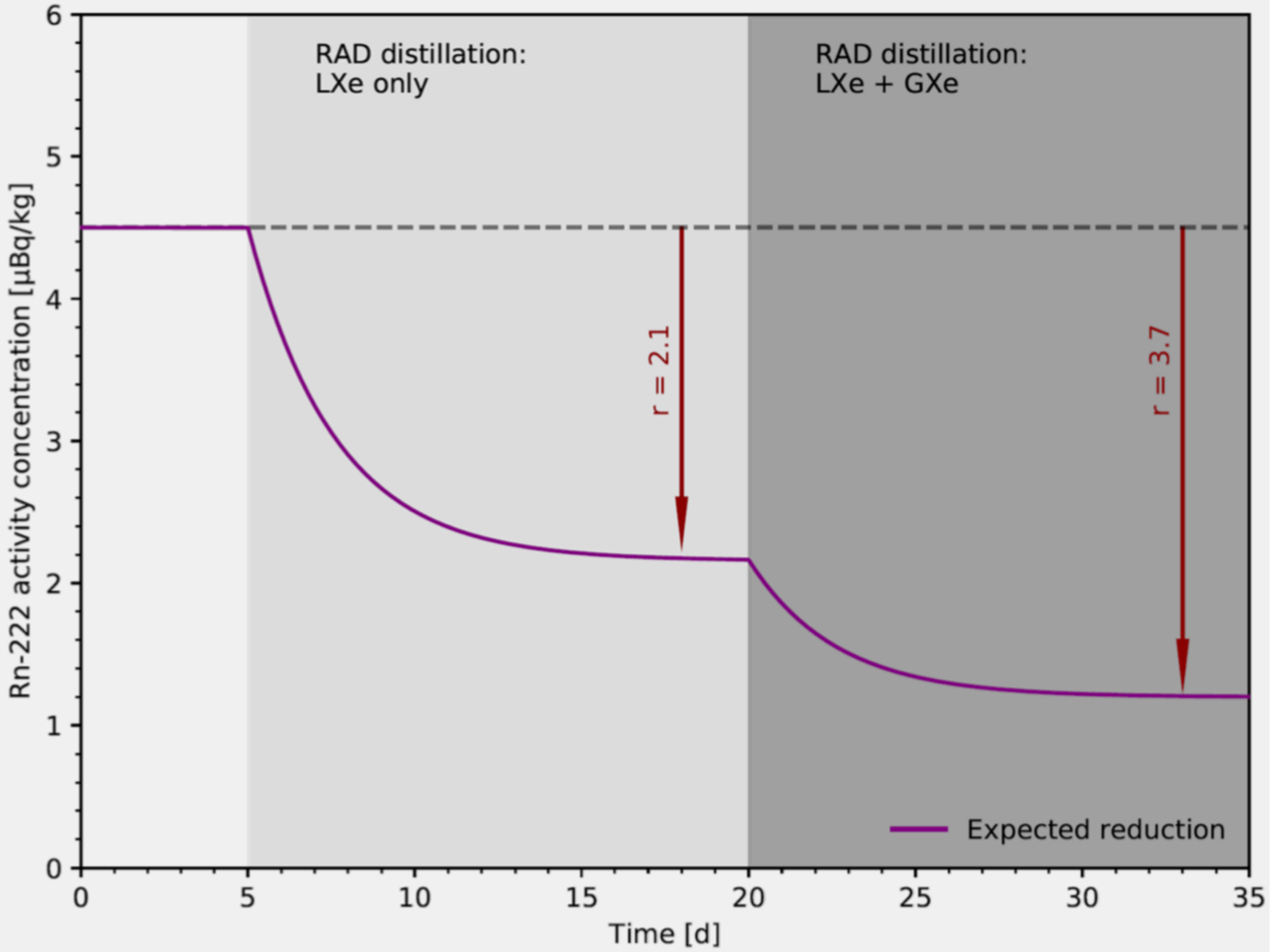
Key performance parameter

- liquid xenon inlet and outlet
- flow of 0.4 l/min LXe = 200 SLPM ≈ 70 kg/h
- radon reduction of factor 2 for sources within detector
- further reduction by gas extraction from cryogenics

Basic removal concept proven: EPJ C77 (2017) 358, arXiv:2009.13981



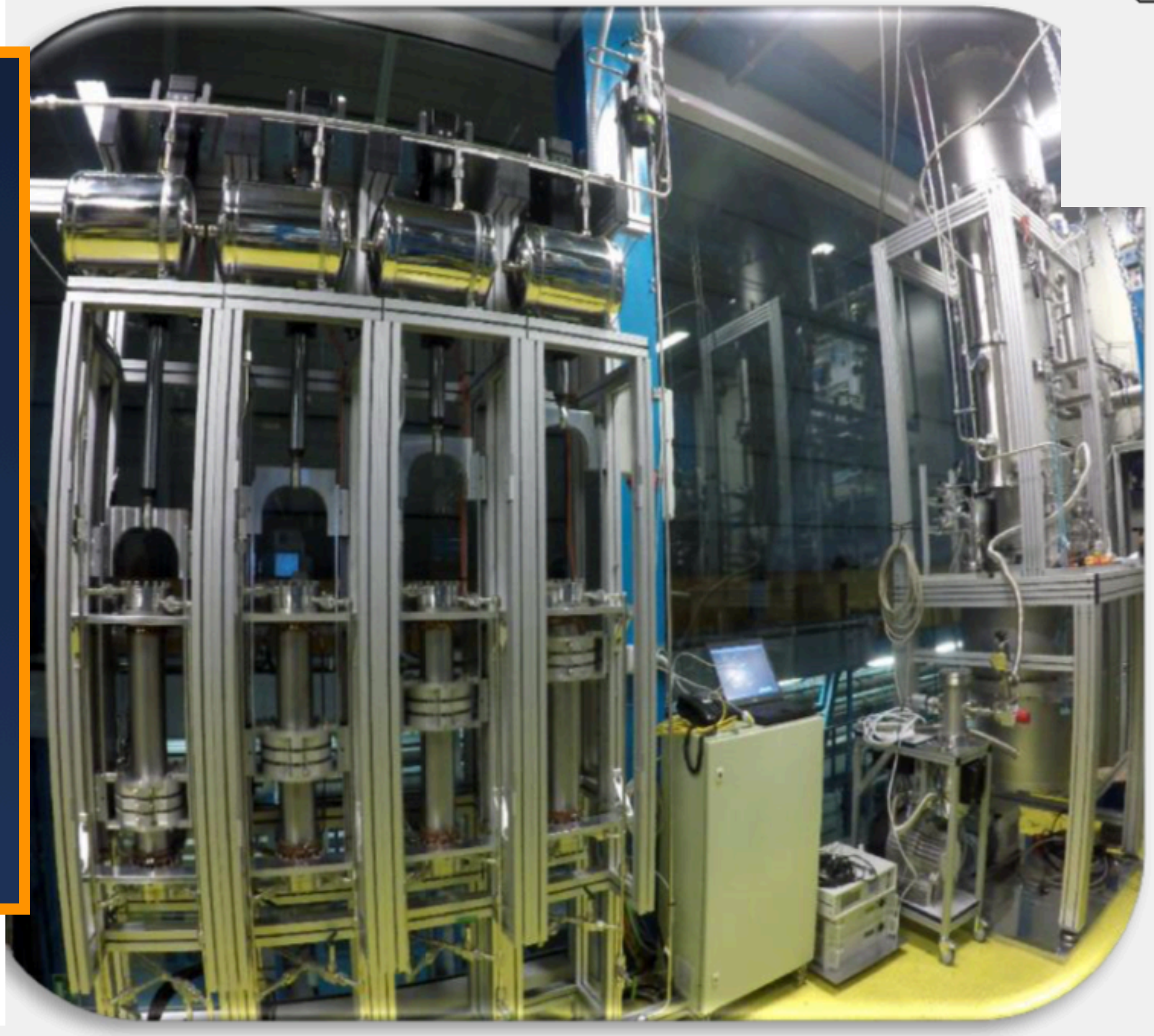
Expectation from radon emanation (J. Palacio T45.5) and radon removal system parameters



NEW RADON REMOVAL SYSTEM

ER background reduction

- Dedicated Rn cryogenic distillation column
- 1 μBq/kg ^{222}Rn level (goal)
- In XENON1T was
  13 μBq/kg (science run)
  4.5 μBq/kg (latest R&D run)



XENONnT performances: Rn and Kr/Ar distillation

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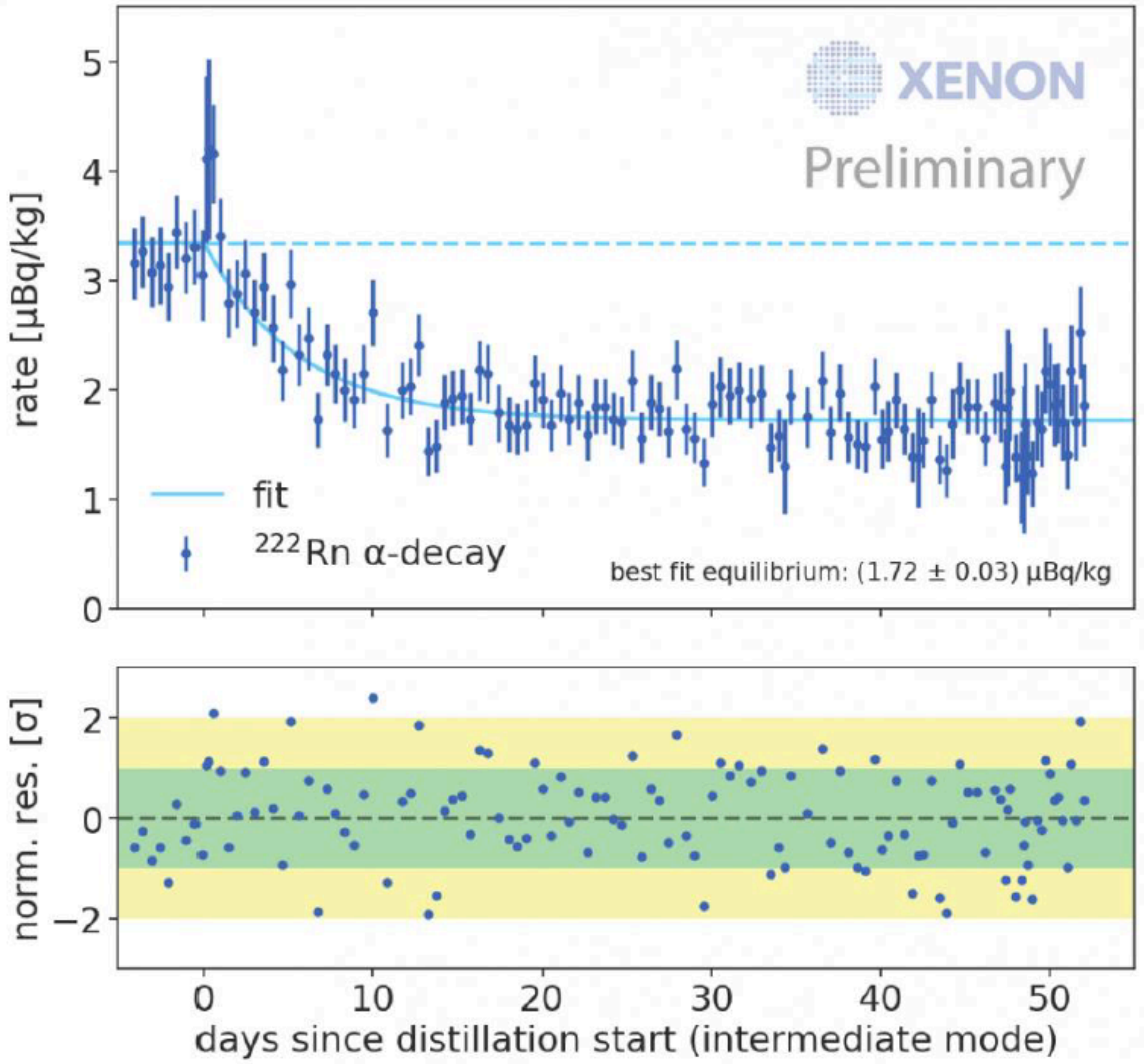
Radon distillation

Design, construction and commissioning of a high flow radon removal system for XENONnT

- Novel distillation column to separate Rn from Xe in the gas phase thanks to its lower vapor pressure
- 1.7 μBq/kg ^{222}Rn achieved, expected further reduction to reach XENONnT goal of 1 μBq/kg

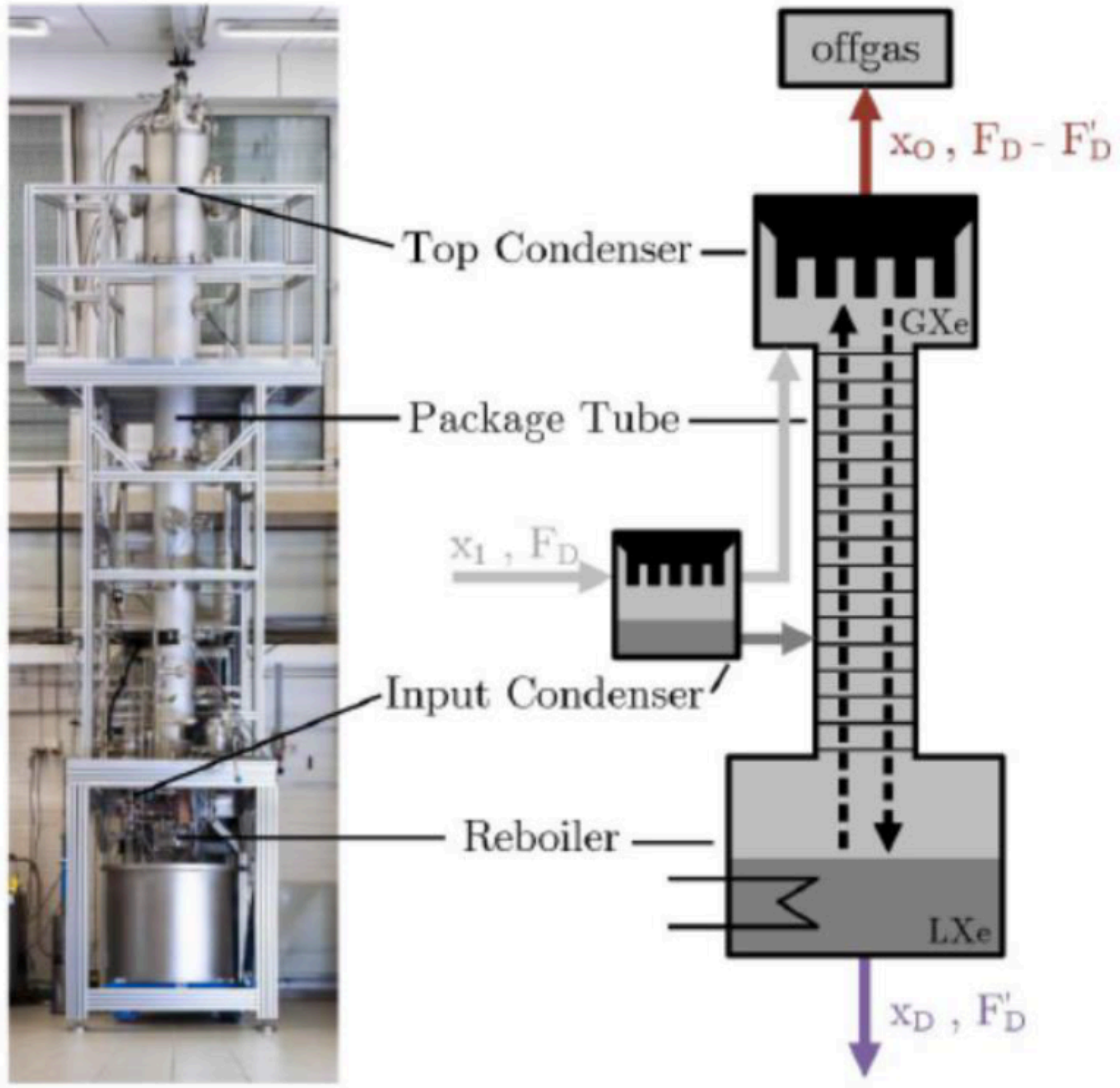


M. Murra, D. Schulte, C. Huhmann, C. Weinheimer
e-print: arXiv:2205.11492 [physics.ins-det]

Krypton distillation

Application and modeling of an online distillation method to reduce krypton and argon in XENON1T

- Kr/Ar distillation based on their higher vapor pressure compared to Xe at -96 °C (goal 100 ppq)
- Inherited from XENON1T



XENONnT: neutron veto

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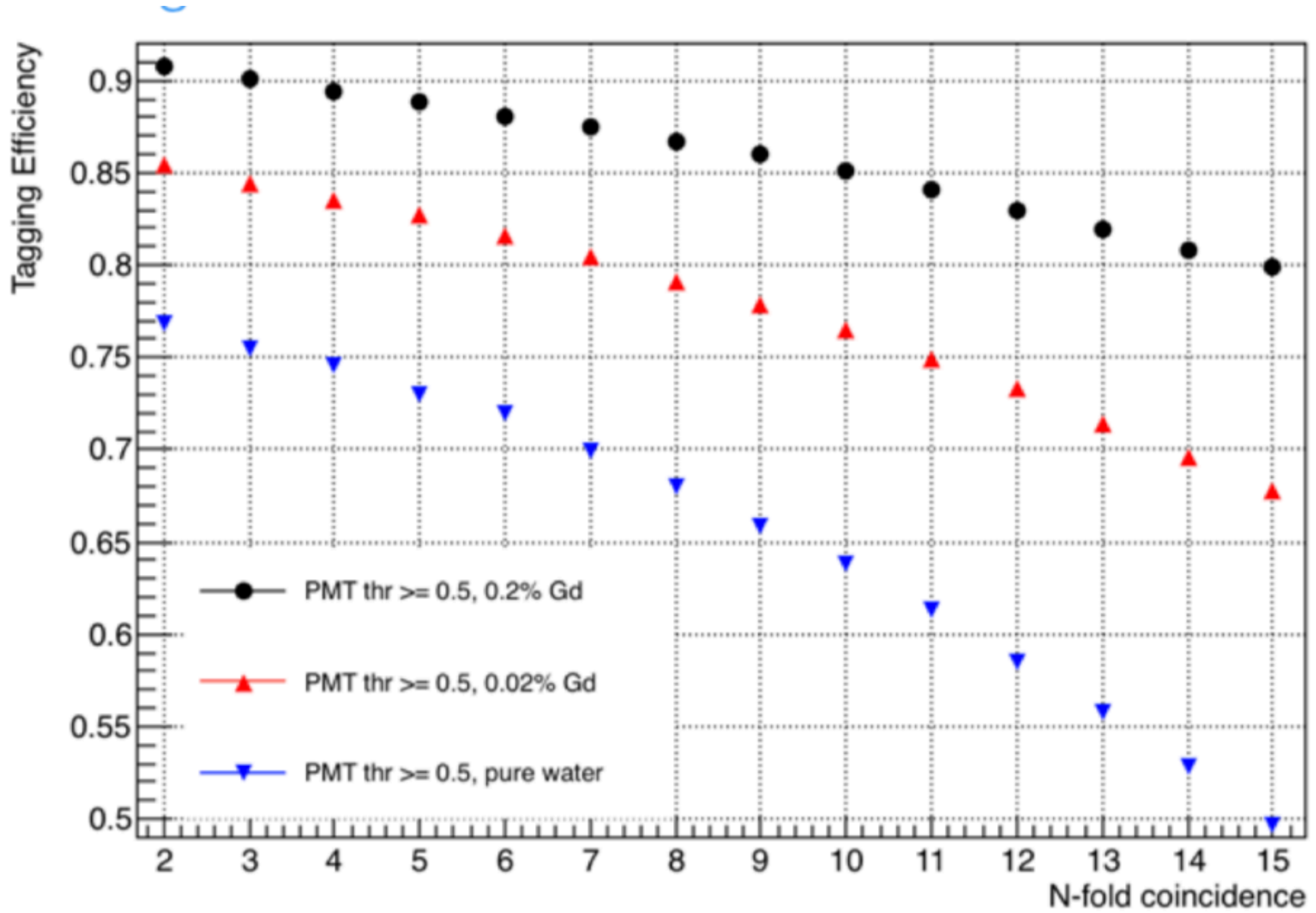
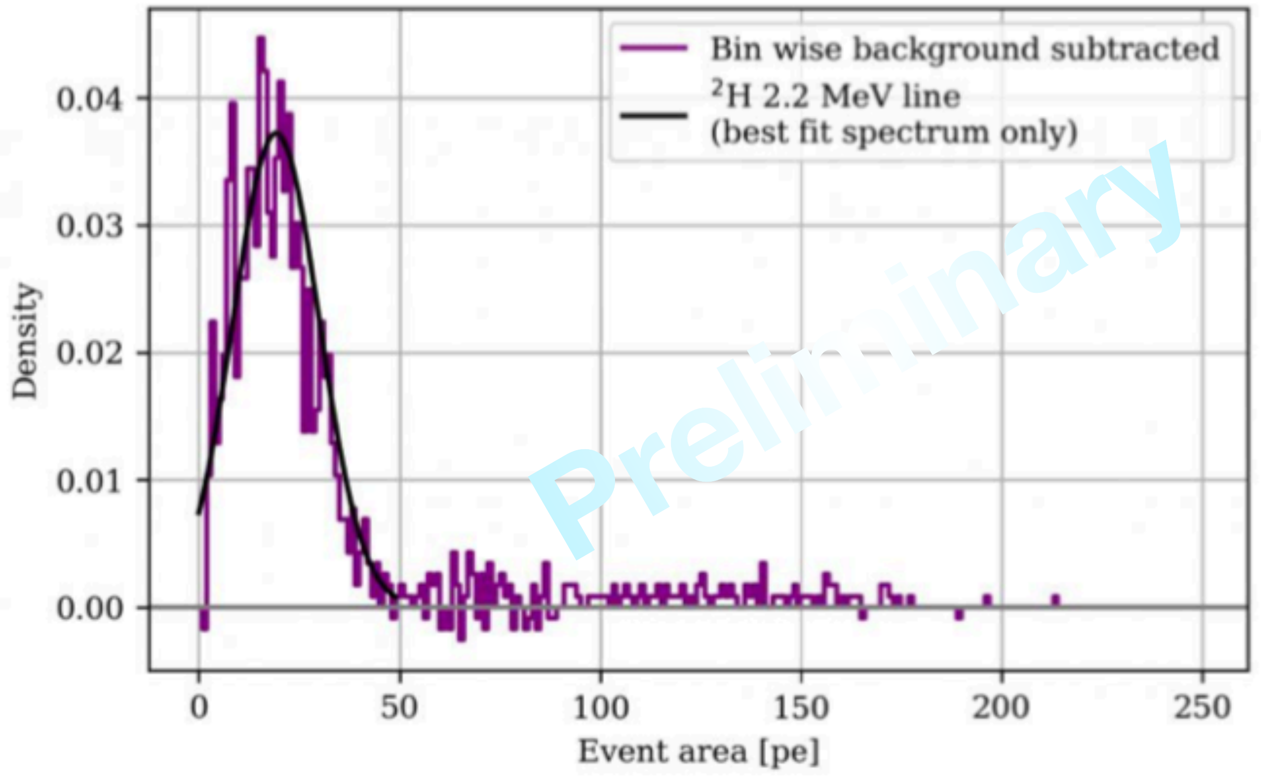
Gd-loaded Water: 0.2% of Gd in mass
-> 3.4 t of Gd-sulphate-octahydrate;
(technology from EGADS-SK colleagues)

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

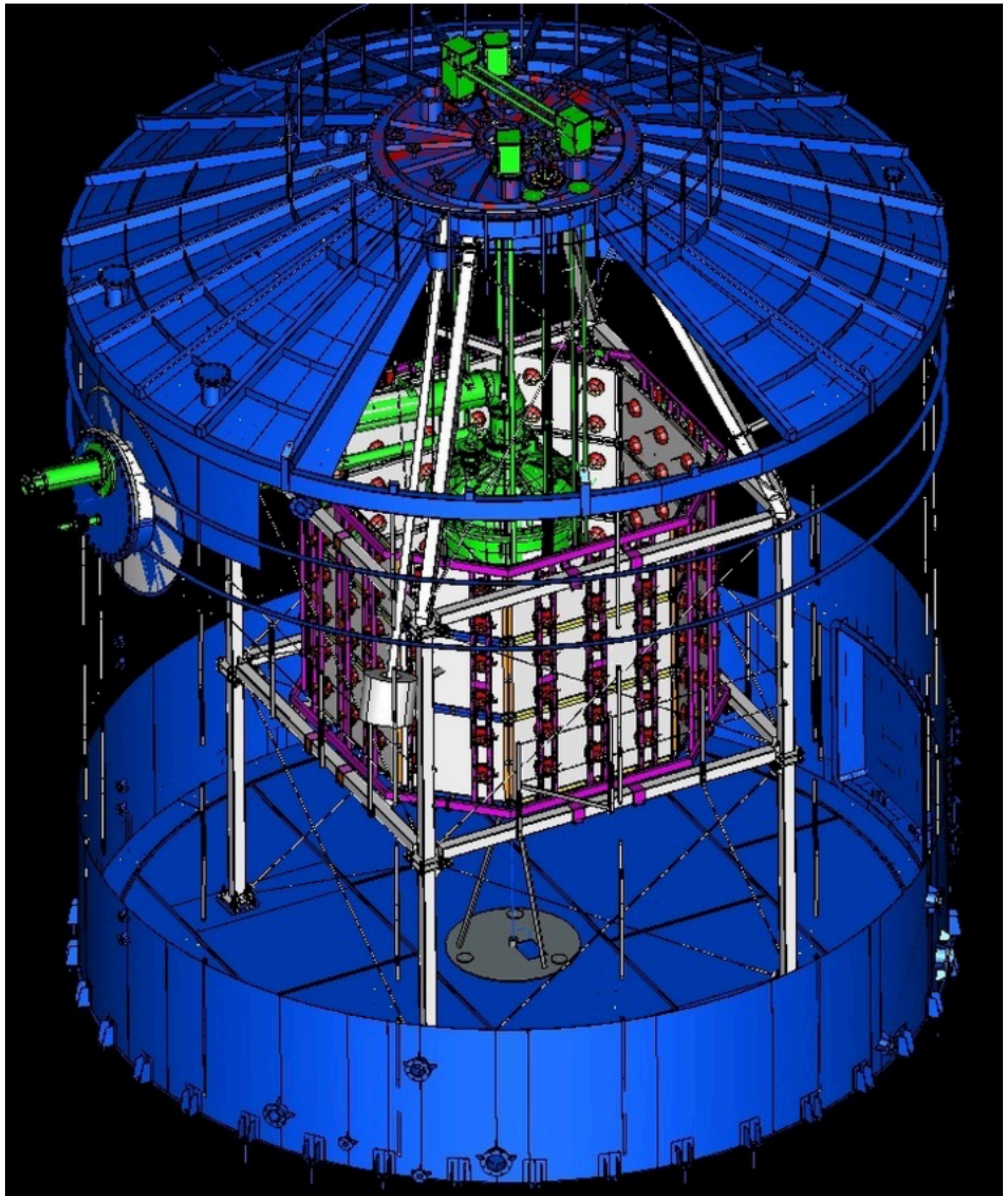
high-reflectivity foil to confine an inner nVeto region with high light collection efficiency.





Neutron tagging efficiency:
85% predicted with 0.2% Gd,
68% **measured in SR0** with pure water
(requiring a threshold of 5 pe)

XENONnT nVeto



XENONnT: neutron veto

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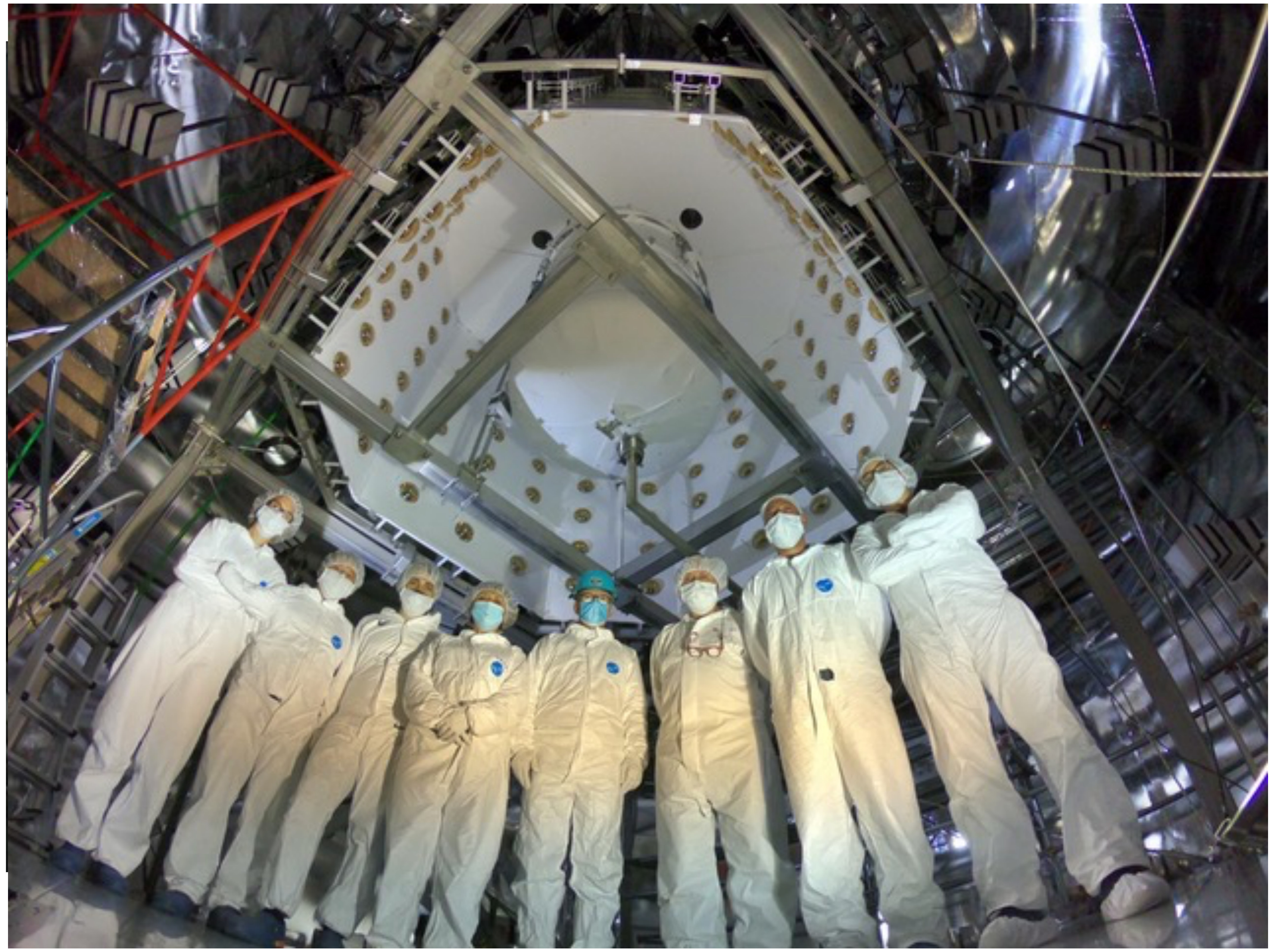
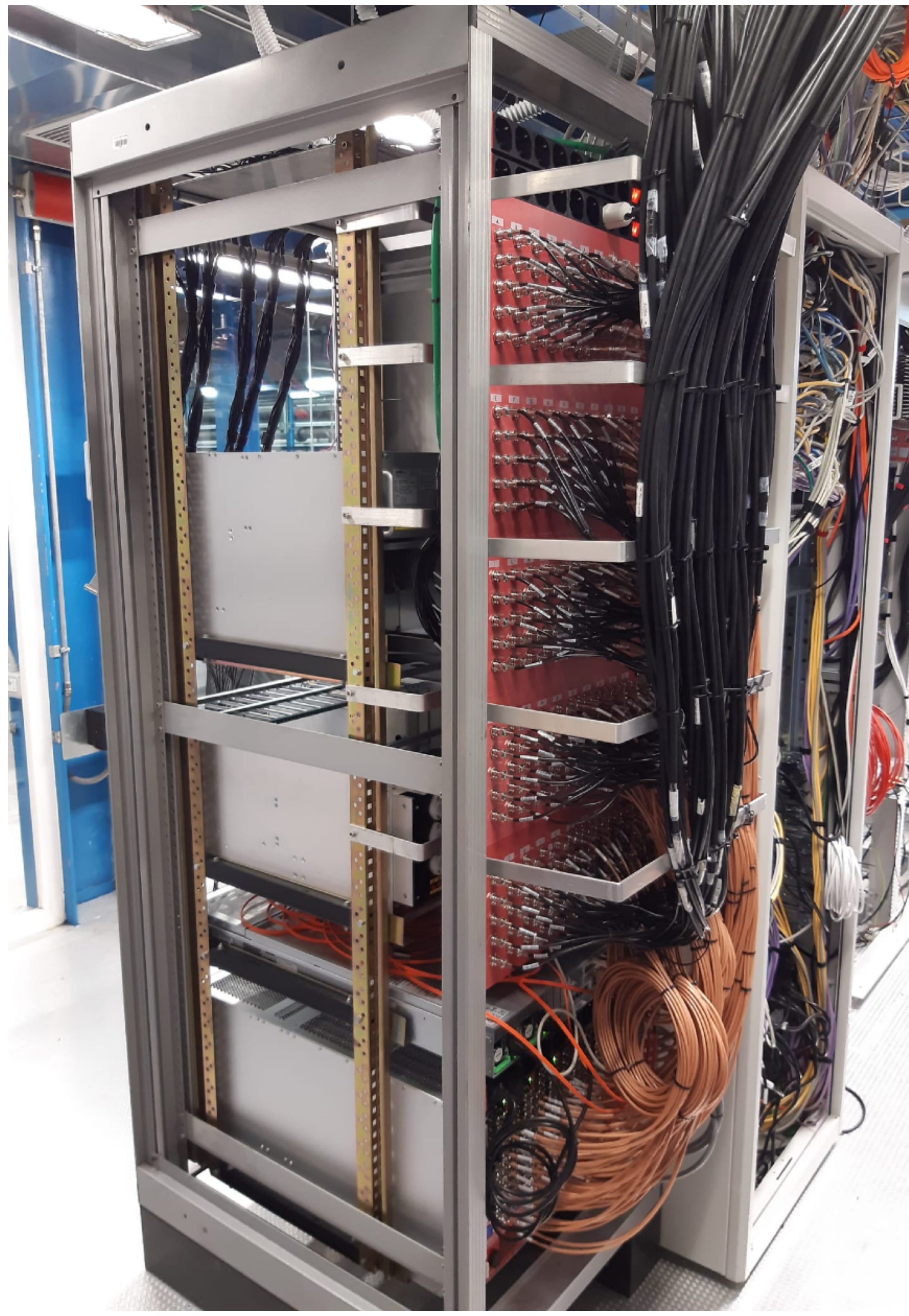
https://www.nature.com/articles/d41586-020-02741-3





XENONnT: GdPlant

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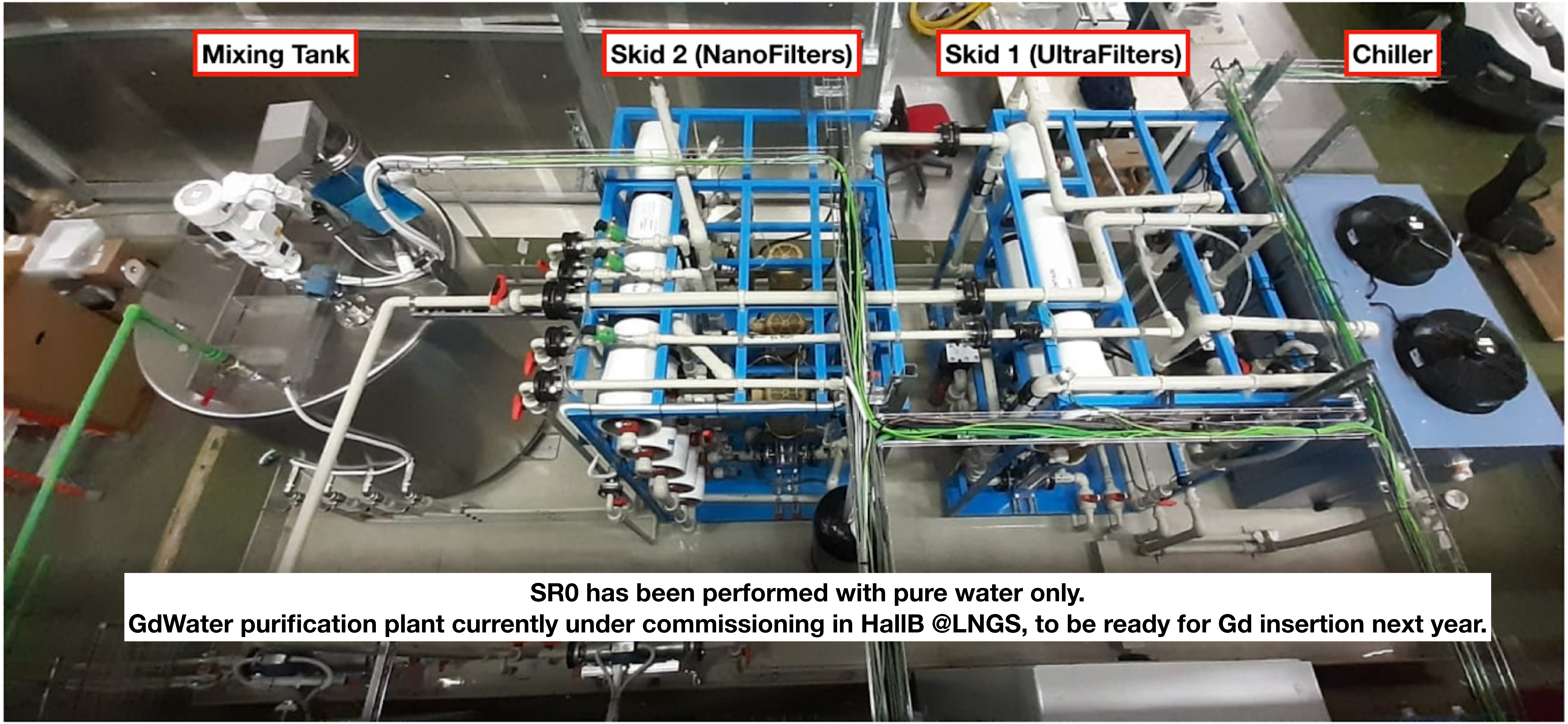

SR0 has been performed with pure water only.
GdWater purification plant currently under commissioning in HallB @LNGS, to be ready for Gd insertion next year.

First results from low-energy ER in XENONnT

XENONnT: First Science Run

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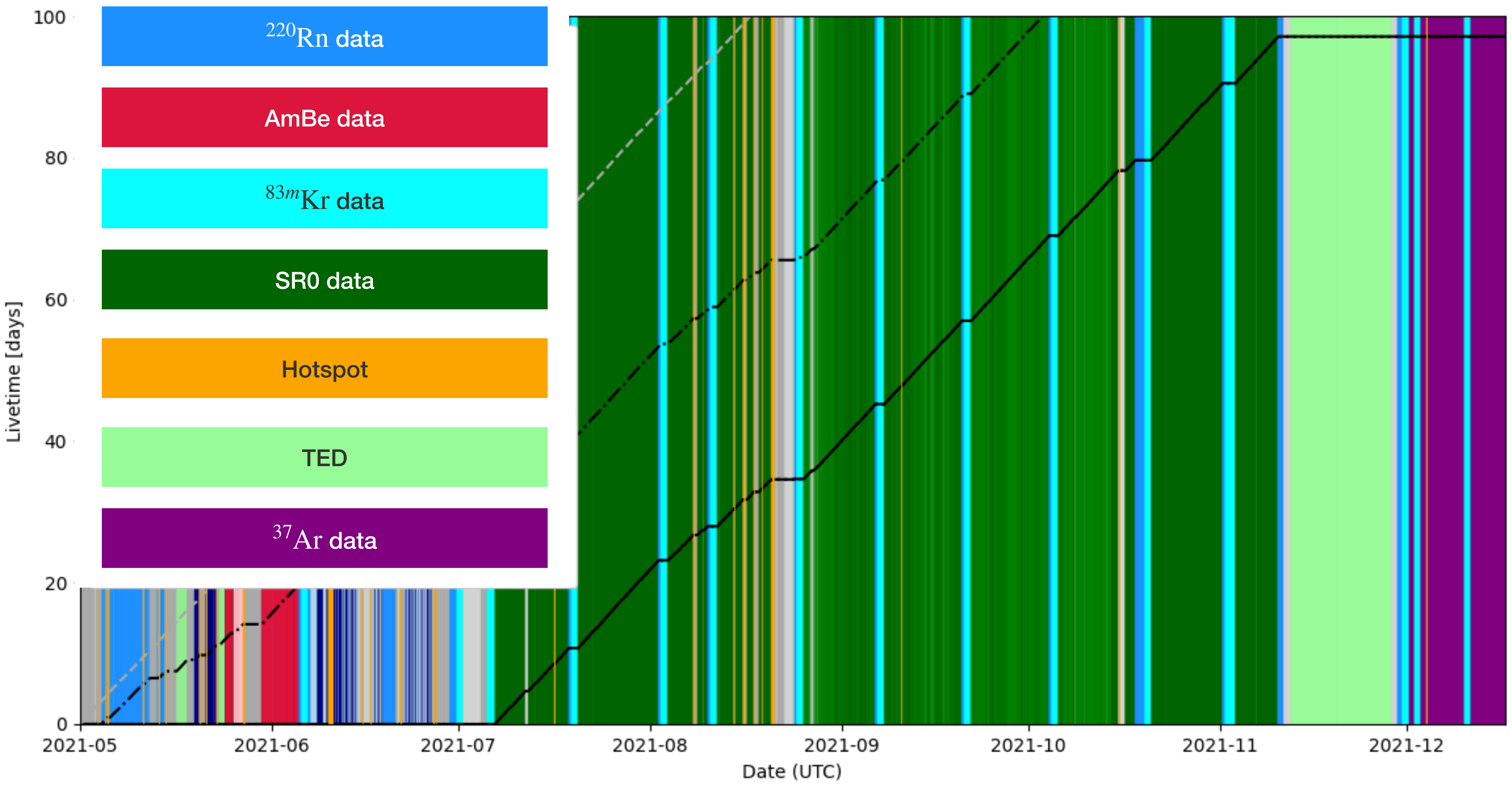

- 97.1 days exposure from July 6th-Nov 11th 2021
- Rn column in gas-only mode
- All but 17 PMTs working, gain stable at 3%
- 23 V/cm drift field, Extraction Field in LXe 2.9 kV/cm
- Localised high single-electron emission occurring seemingly at random, anode ramped down

XENONnT: corrections and efficiency

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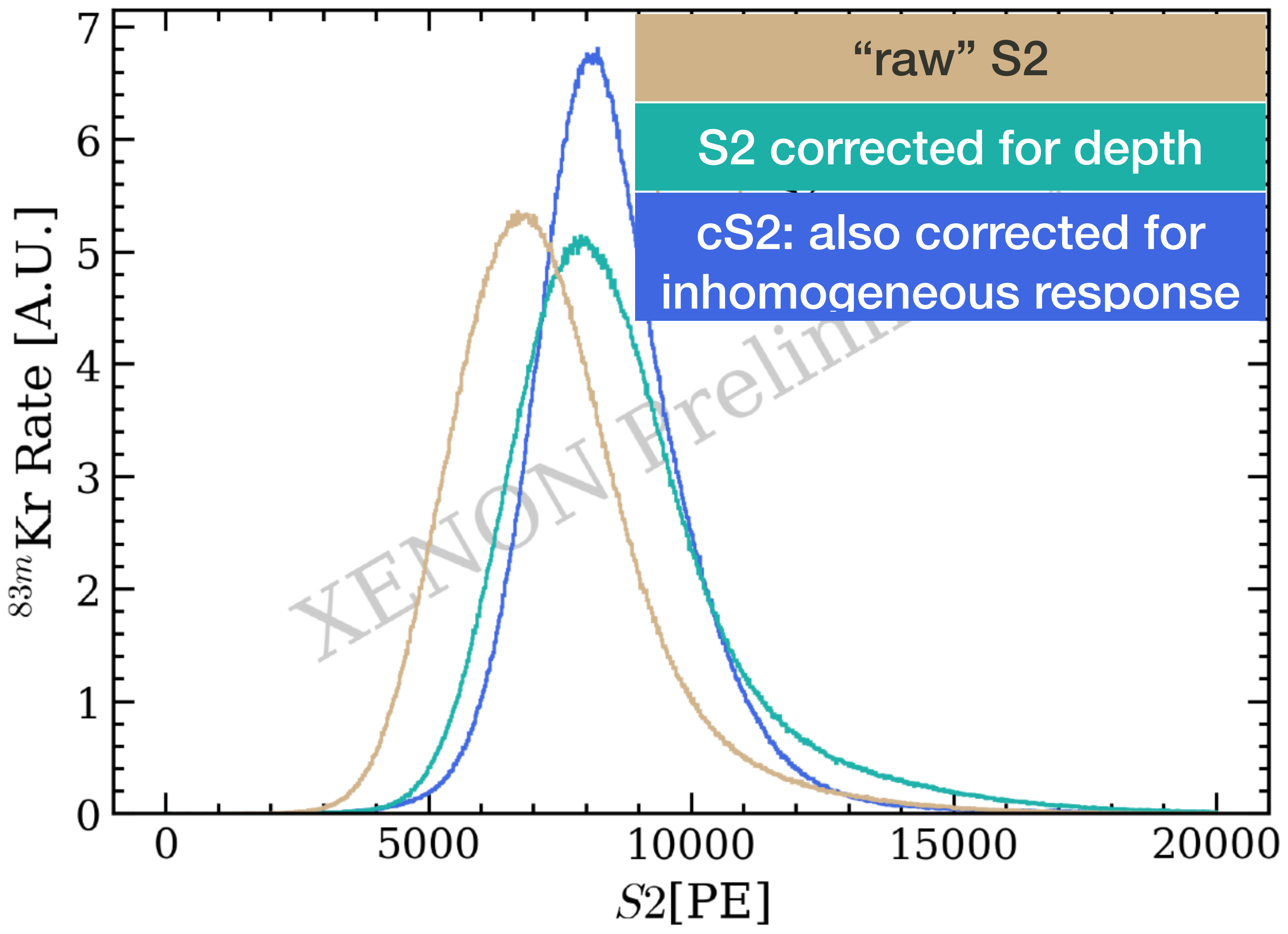
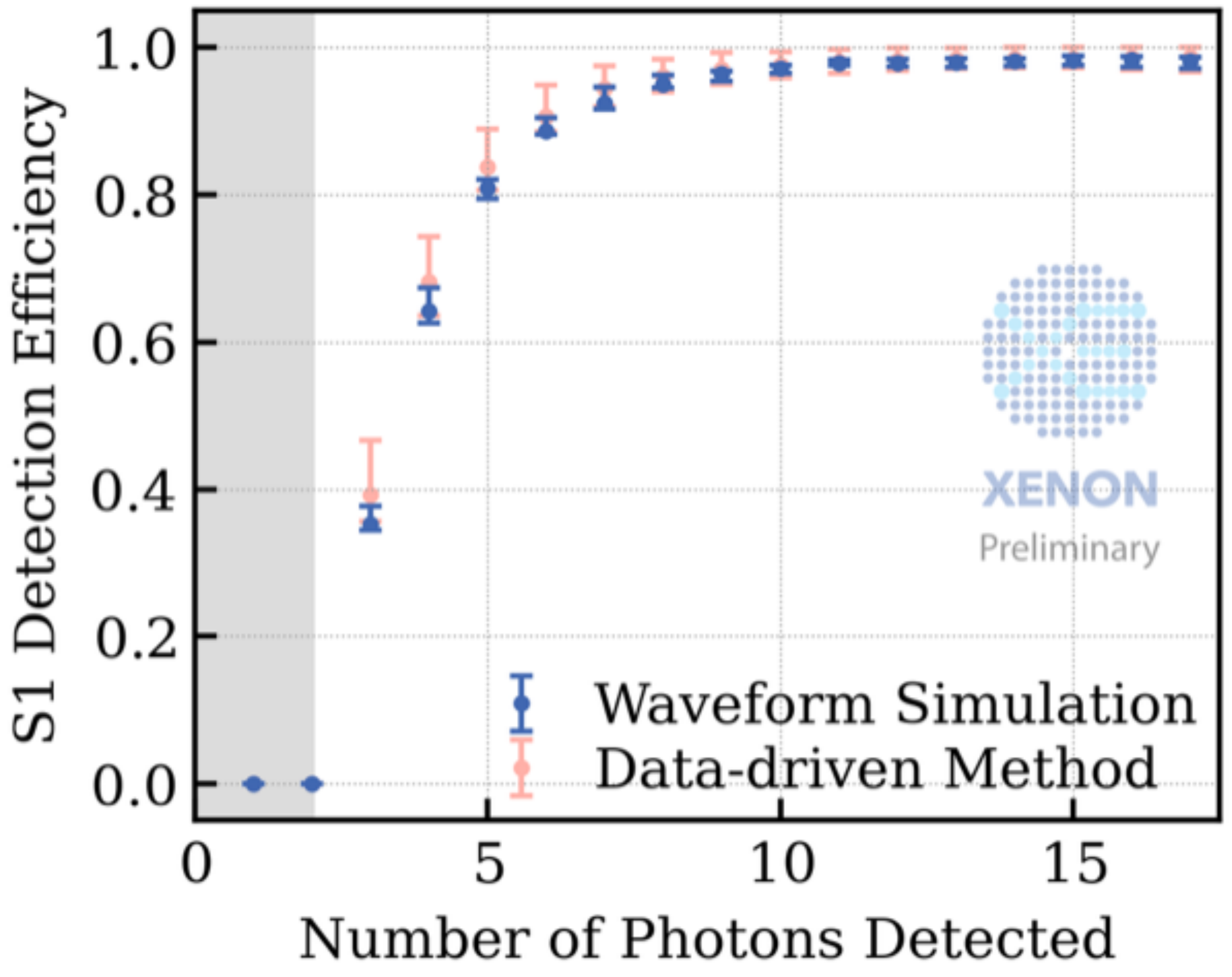


- The SR0 analysis effort covers
  - Peak and event reconstruction,
  - "corrections"— compensating for detector responses to give good estimators
  - Data quality validation, cuts against backgrounds
  - Backgrounds models
  - Detector response modelling
  - Inference

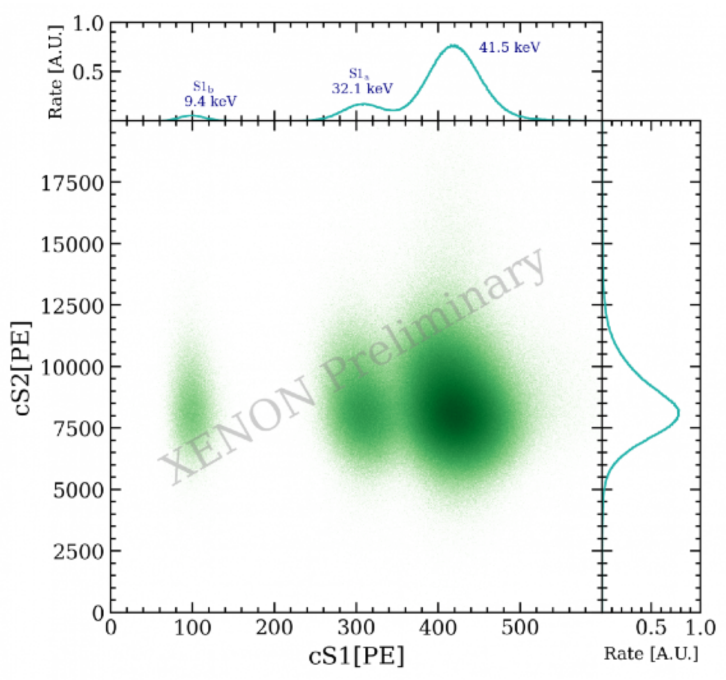
- At threshold, S1s may consist of only a handful of photons, while we require 3 coincident hits.
- Estimated with detailed "waveform simulation" and a data-driven approach drawing subsamples of photon hits to make up a pulse
- In both cases, given to the reconstruction chain to characterise efficiency: probability to reconstruct a peak
- Waveform simulation used for this analysis, data-driven for validation— include an uncertainty band that covers the difference between these methods.

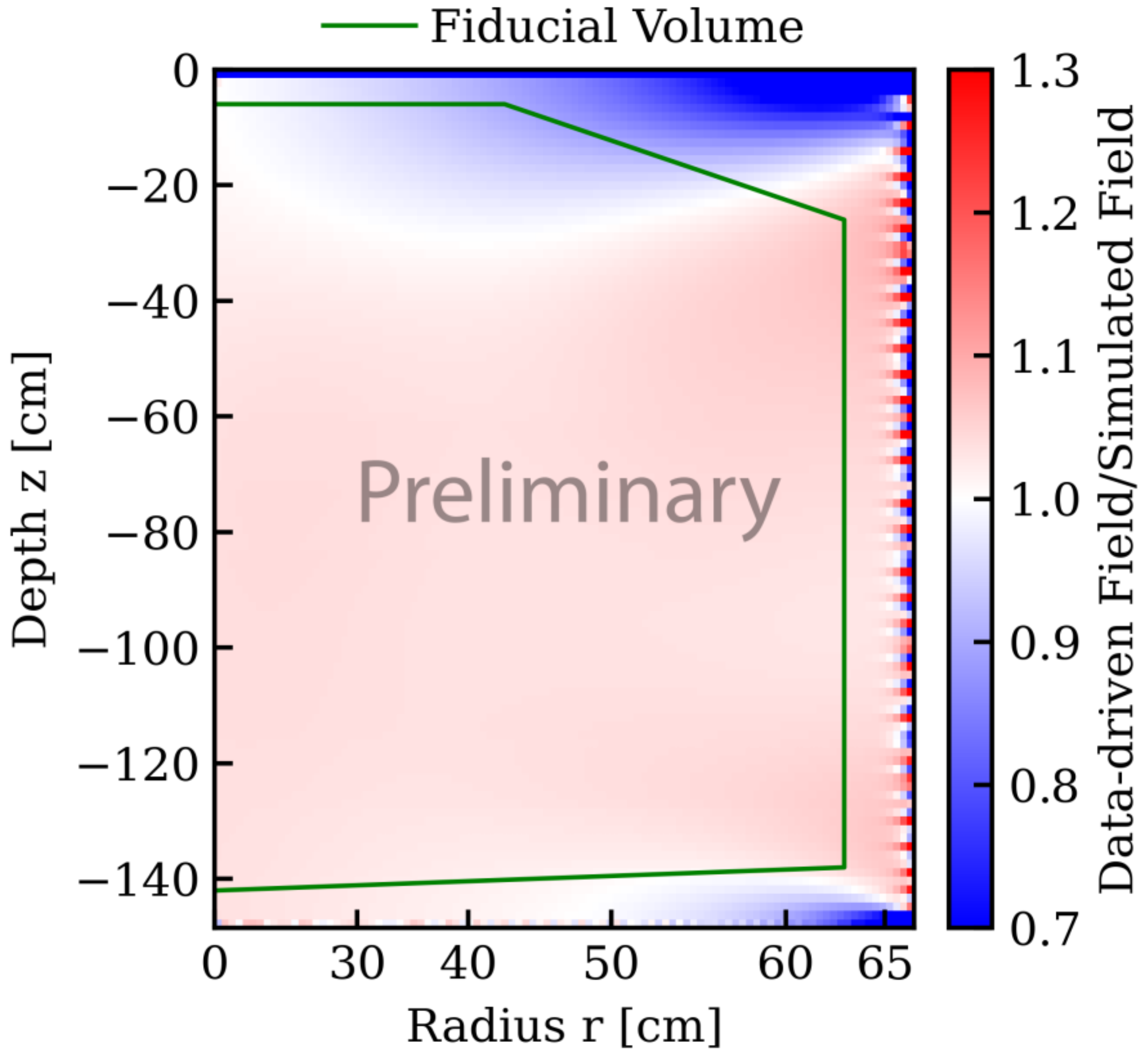


^{83m}Kr

- ^{83m}Kr is injected every 14 days
- Decays slowly enough ($T_{1/2} = 1.83$ h) to distribute uniformly in the detector, used to compute:
  - the S1 light collection efficiency as function of position
  - The S2 light collection efficiency as function of horizontal position
  - The position reconstruction distortion induced by our field
- Validated COMSOL field simulation using observed ^{83m}Kr signal ratio $S(32.1\text{ keV})/S(9.4\text{ keV})$

LUX describing the field method: Phys. Rev. D 96, 112009 (2017)

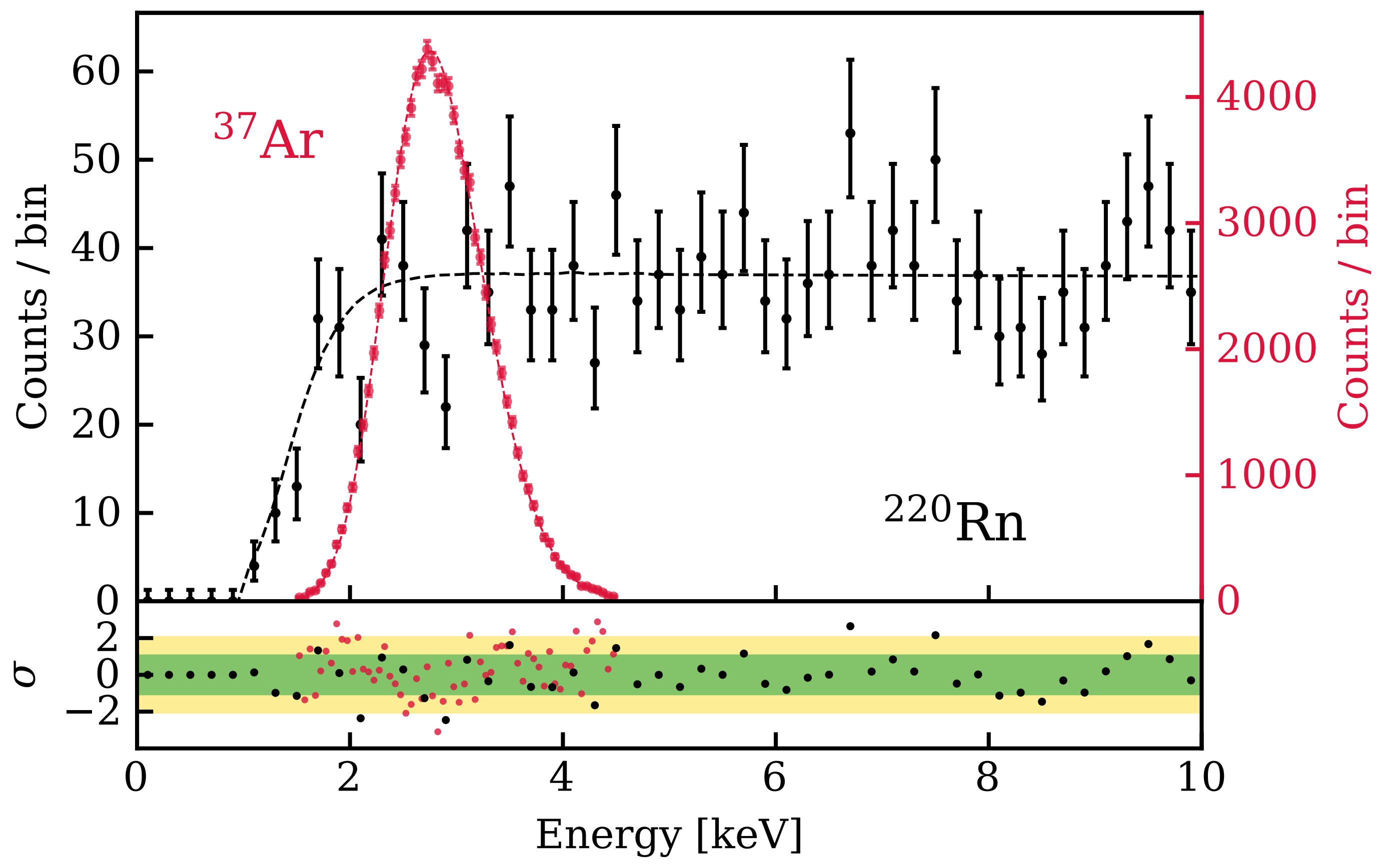


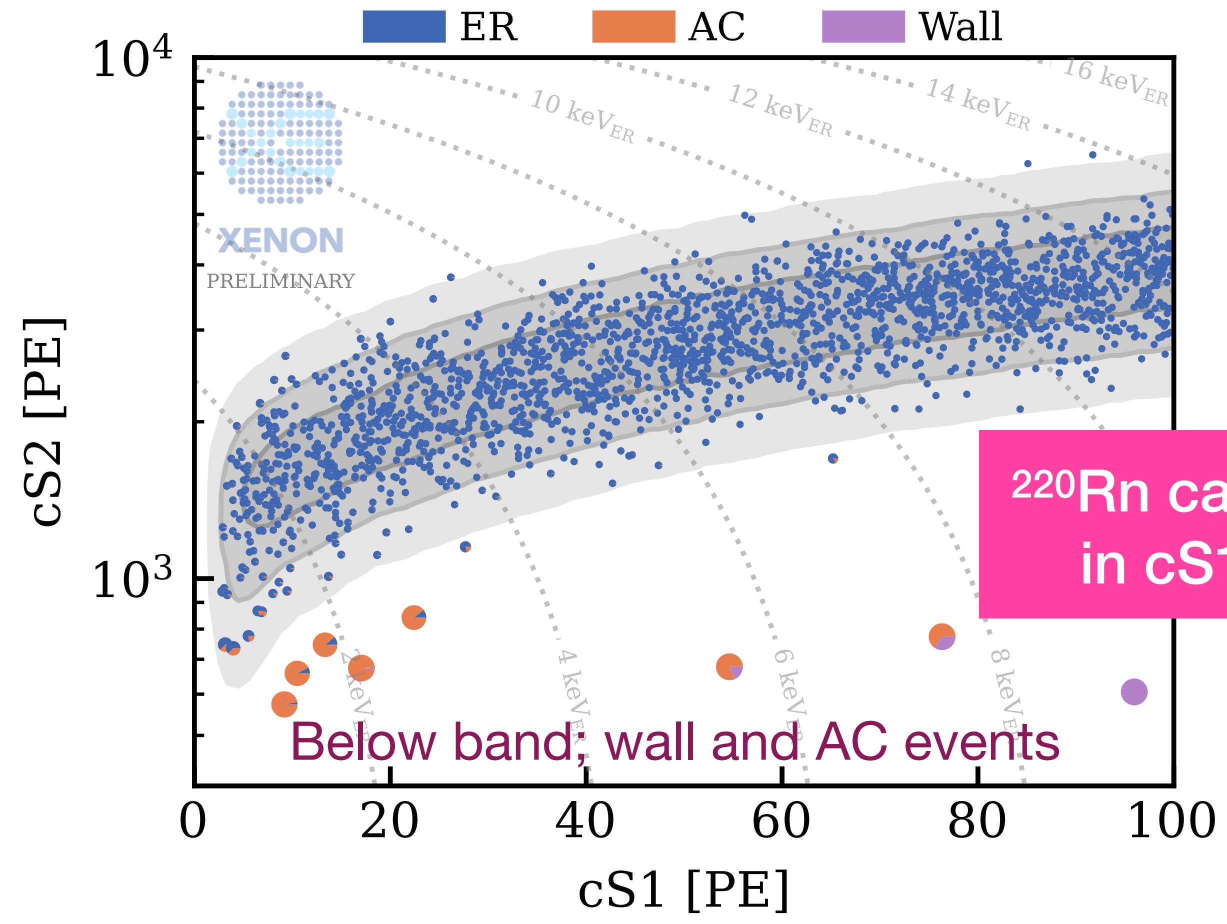


^{37}Ar and ^{220}Rn

- At low energy, we have two ER calibration sources:
  - ^{37}Ar, which gives mono-energetic 2.82 keV peak used to anchor the low-energy response and resolution models with high statistics
  - ^{212}Pb from ^{220}Rn gives a roughly flat β-spectrum to estimate cut acceptances and also validates our threshold.
    - Also used to define our blinding region

Rn and Ar calibration in reconstructed energy





^{220}Rn calibration in cS1, cS2

XENONnT: energy scale

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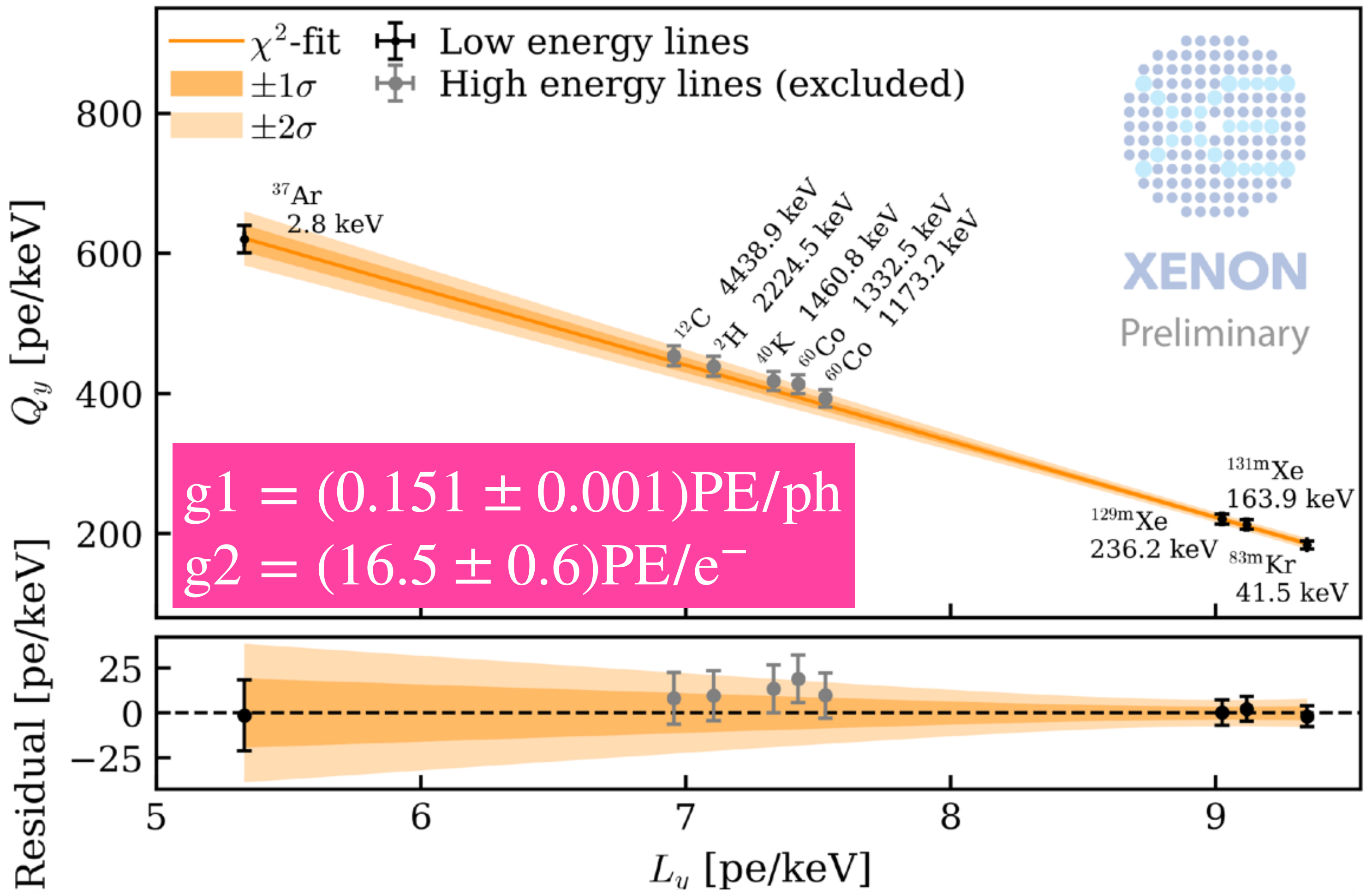
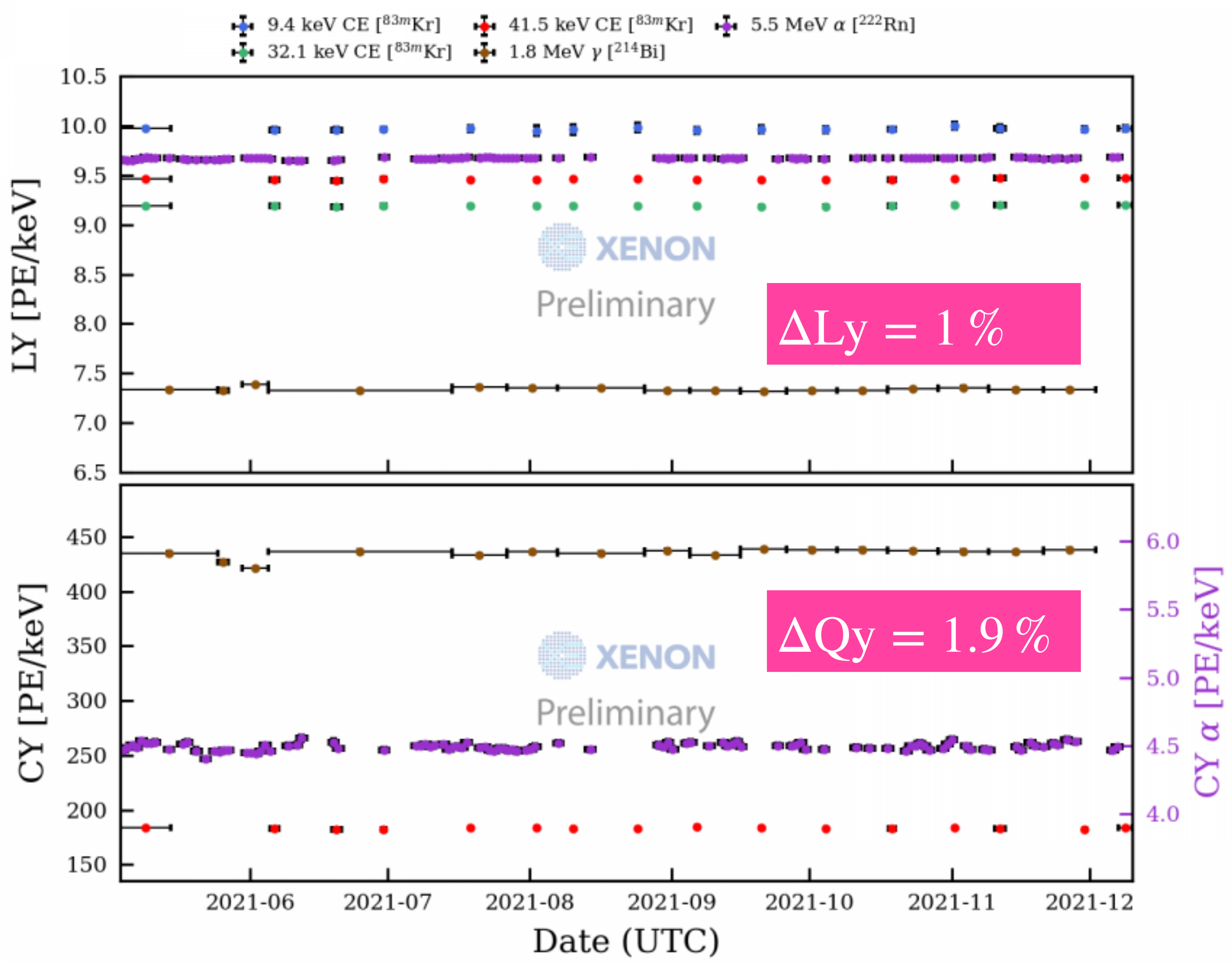
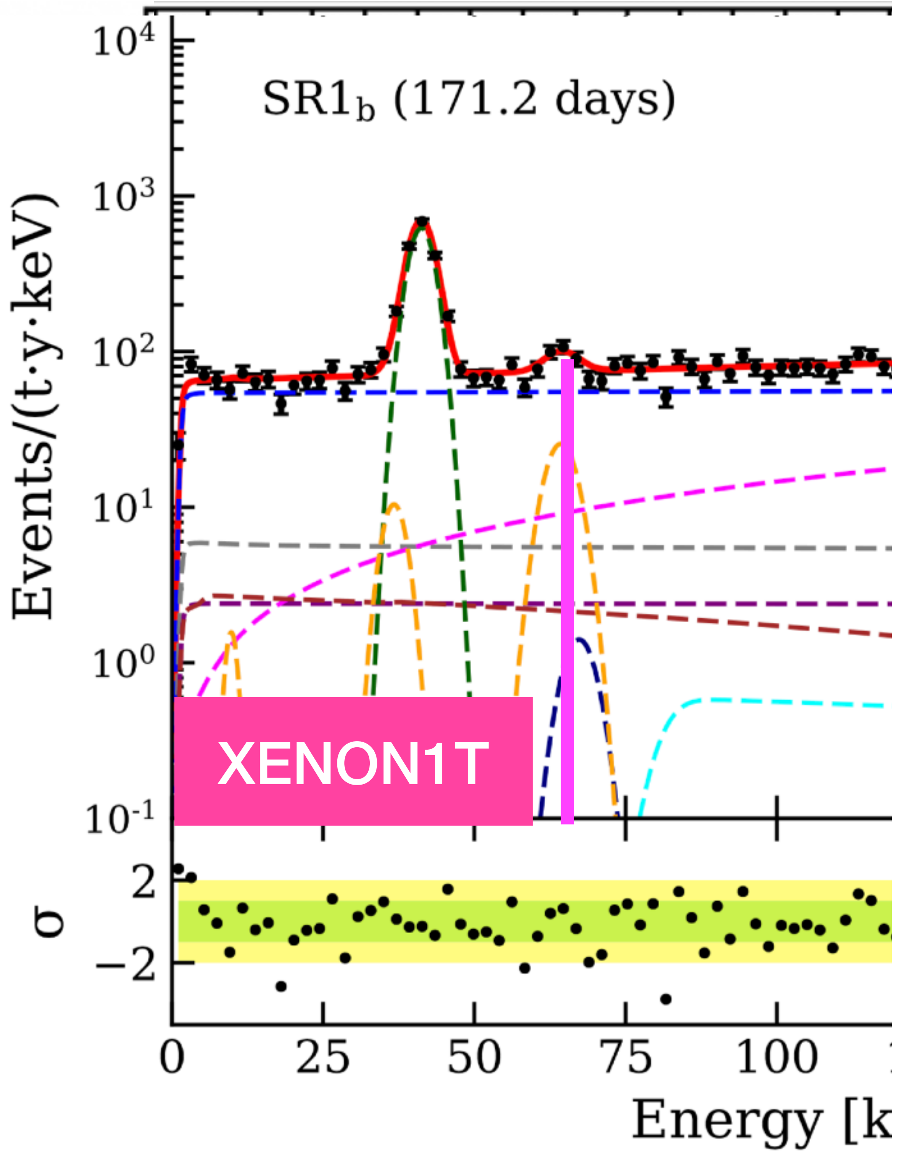
- For ER sources, the entire deposited energy goes to observable light and charge quanta:
  $E = 13.7\text{eV} \times (cS1/g1 + cS2/g2)$
- Mono-energetic peaks with energies relevant to our ER search ($1-140$ keV).
  - ^{37}Ar
  - ^{83m}Kr
  - ^{129m}Xe
  - ^{131m}Xe
- The observed bias in energies from our reconstruction, between 1-2% is included in the modelling.
- We monitor the stability of the light and charge yield over SR0 using the calibration sources, ^{222}Rn αs and material γs

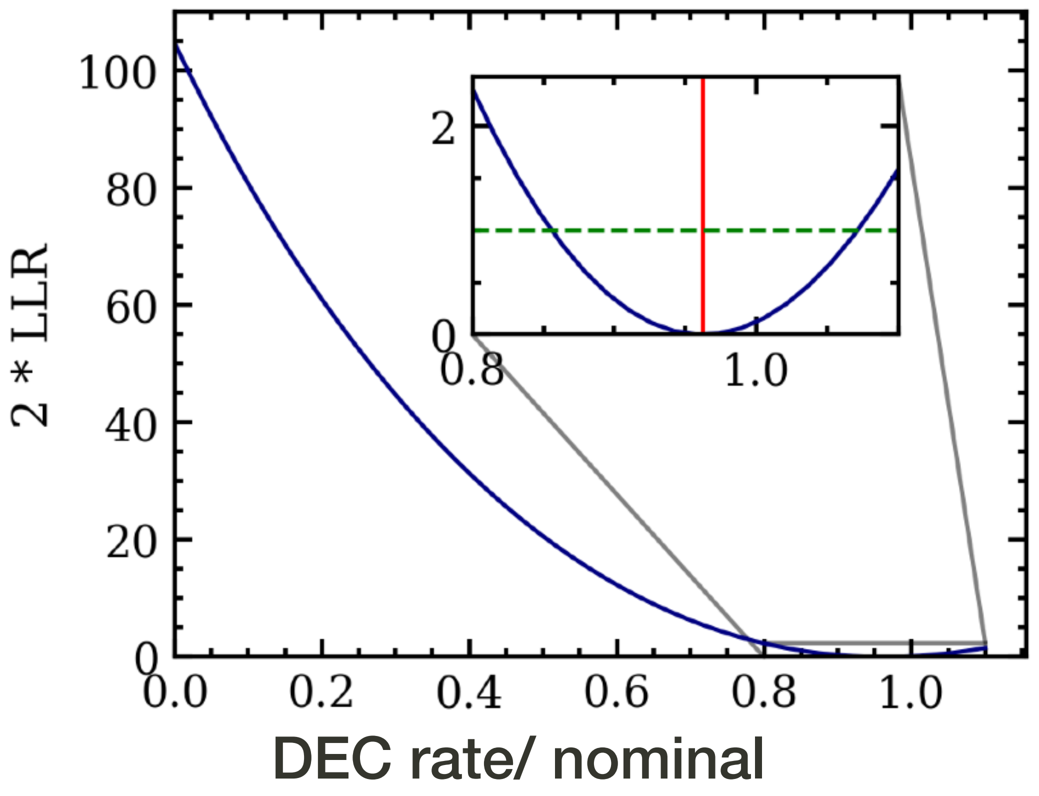




Rare signal (^{124}Xe) becomes a validation tool

- XENON1T first observed the double-electron capture signature from ^{124}Xe— longest half-life directly detected
- In XENONnT, appears as a very clear peak over the lower background, with a rate compatible with previous measurements, left free in background.
- DEC used to cross-check g1/g2 fit



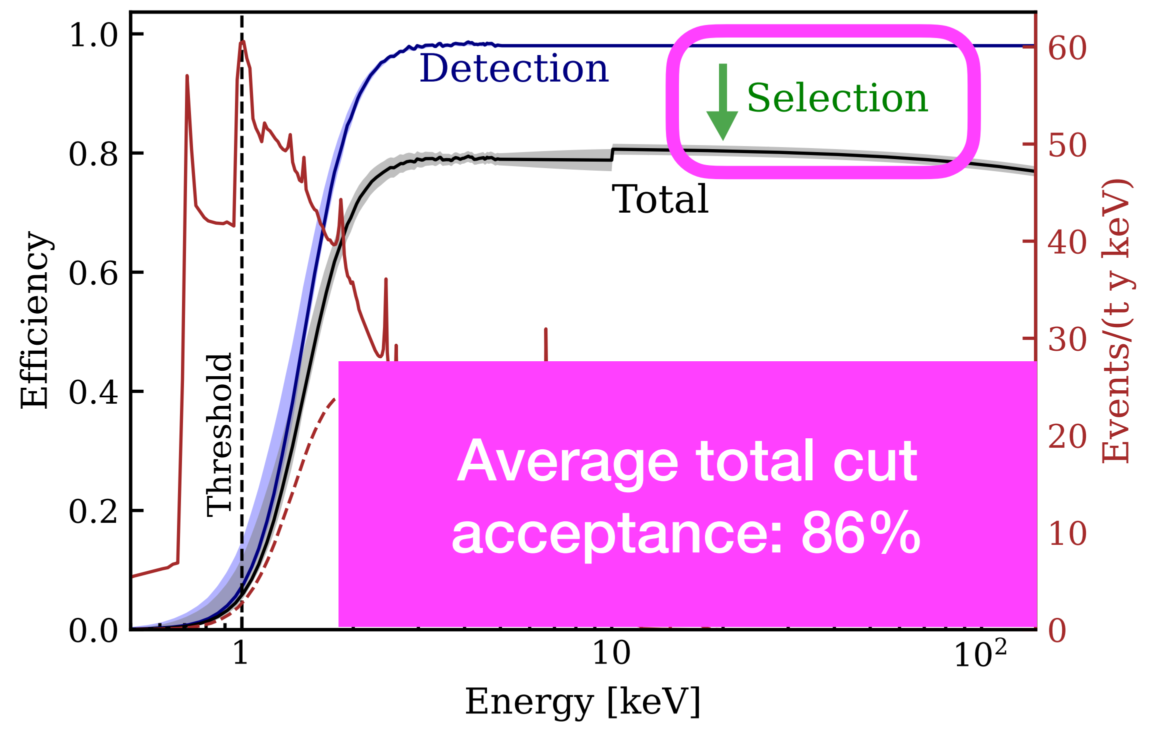


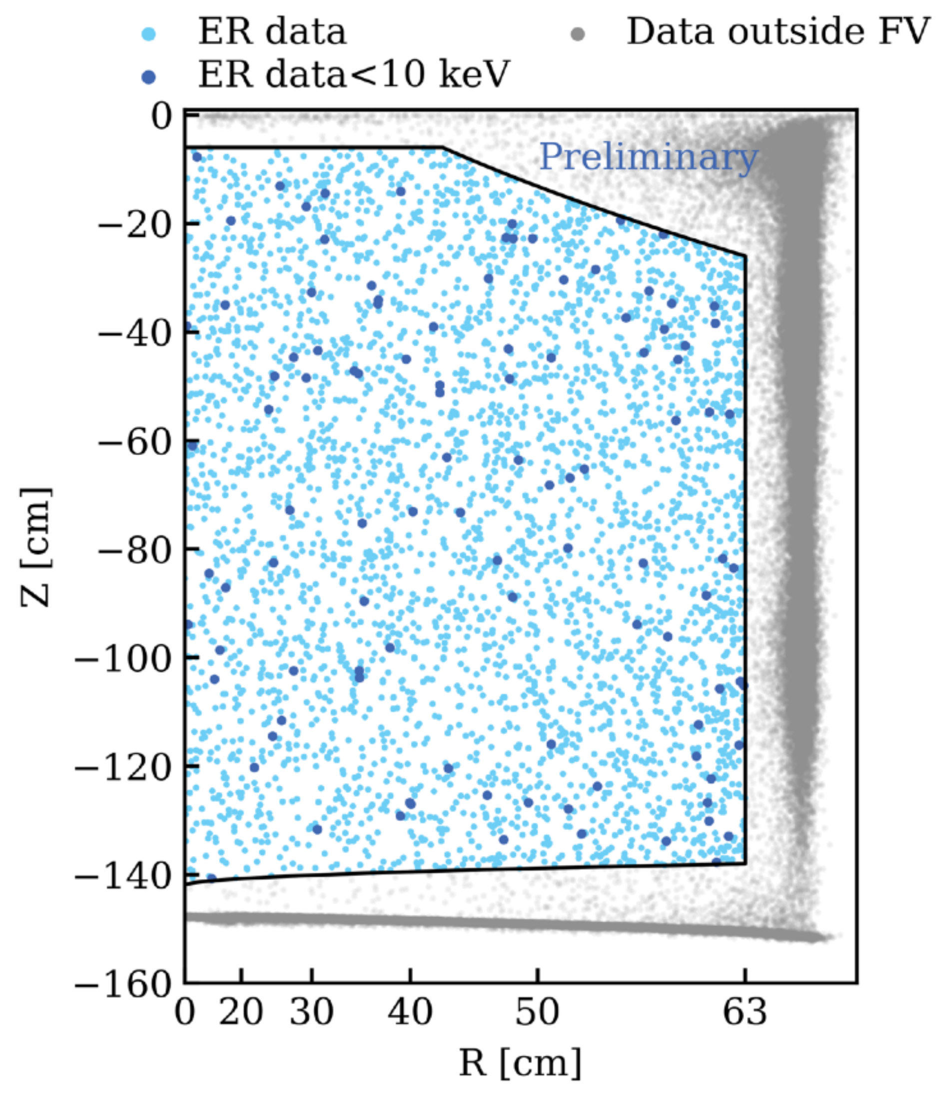
$T_{1/2}^{2\nu ECEC} = (1.15 \pm 0.13_{stat} \pm 0.14_{sys}) \times 10^{22}$yr

XENON1T observation of Double-Weak Decays of ^{124}Xe and ^{136}Xe, arXiv:2205.04158

DATA QUALITY CUTS

- Events are required to pass a range of quality cuts:
  - The S1 and S2 peak should each have patterns, top/bottom ratios etc. consistent with real events
  - An S2 width consistent with the expected diffusion
  - An S2 over 500 PE
  - Not within $< 300\ ns$ of a neutron veto event
- Events must be within ER band
- Fiducial volume cut selects a mass of (4.37 ± 0.14) tonnes with low backgrounds





XENONnT: Measures to prevent and control ^3H

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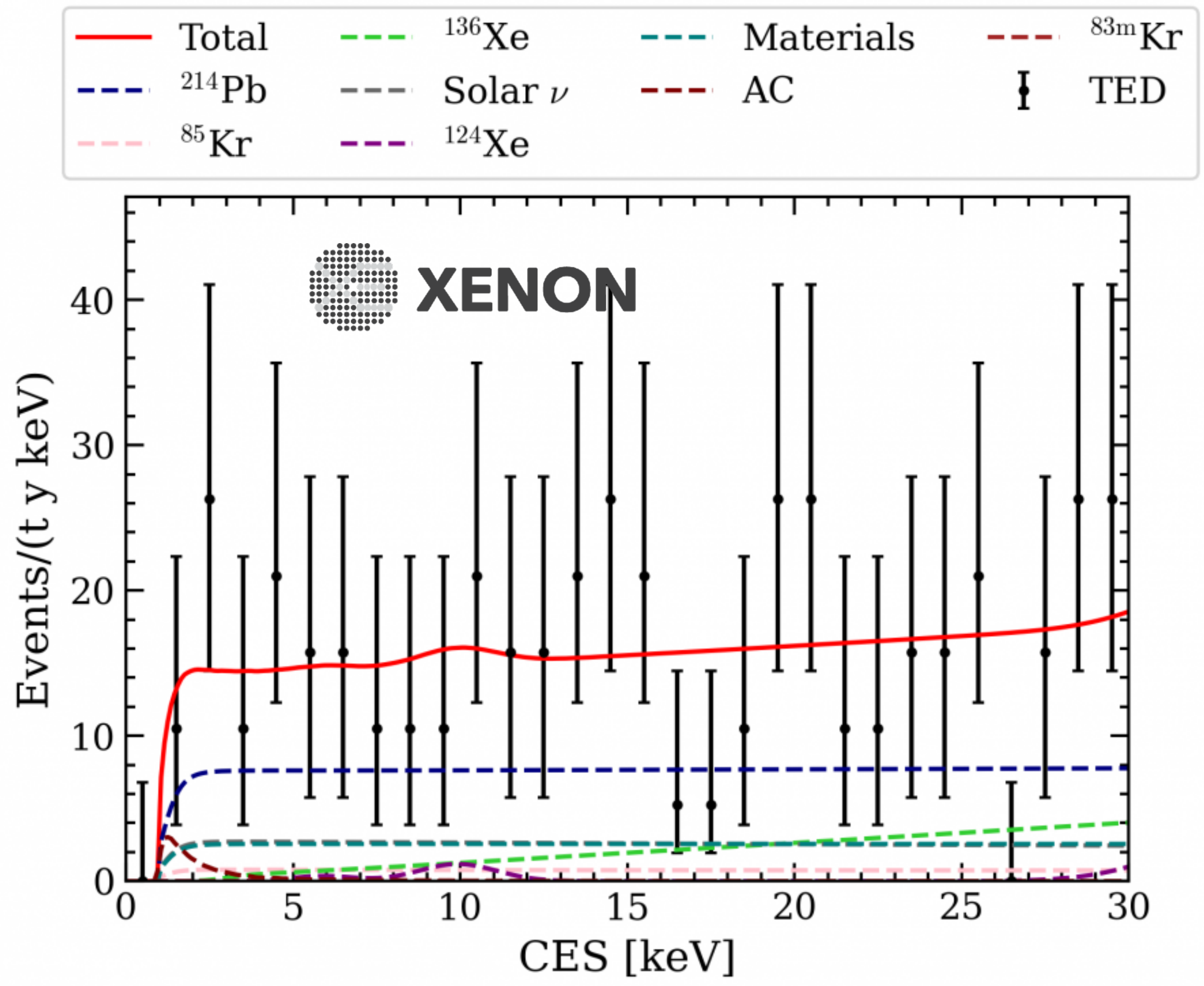
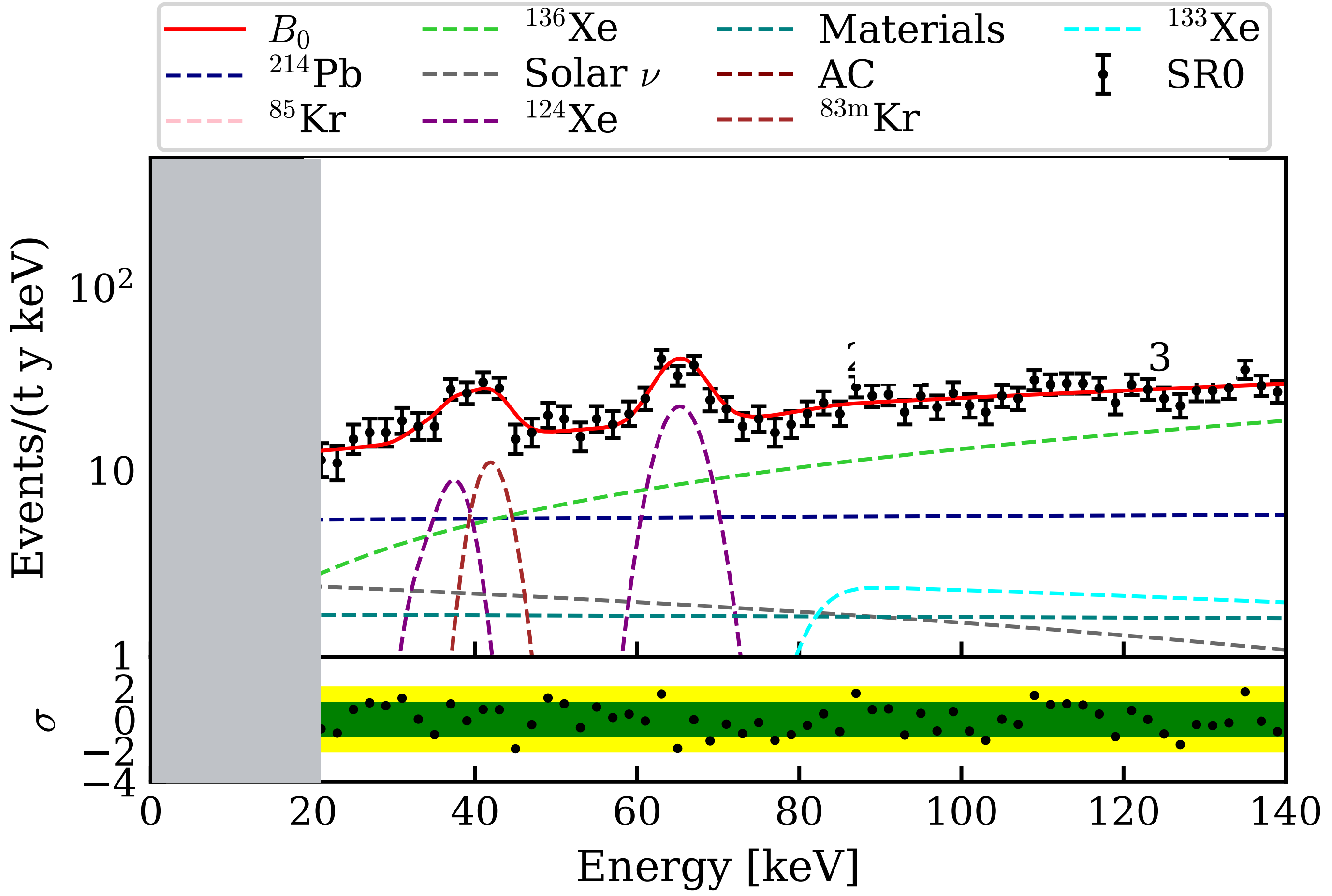
- XENONnT went through significant efforts to reduce possible sources of a low-energy excess as due to Tritium
- About three months of outgassing, and purification of gaseous xenon with Zr getters and 3 weeks of gaseous xenon cleaning reduces possible hydrogen contamination
- Every time GXe or LXe was filled into the cryostat, it was always purified through the getters.
- The most powerful purification in LXe mode makes also tritium removal more effective

Tritium-enhanced data (TED) sideband data used to look for ^3H bypassing getters

- Bypassing getters in the purification loop would increase the equilibrium hydrogen concentration in the detector
- large uncertainty but a best-estimate of several orders of magnitude, and a very conservative estimate of x10
- 14.3 days was taken after the main science run to give an extra handle on a possible excess



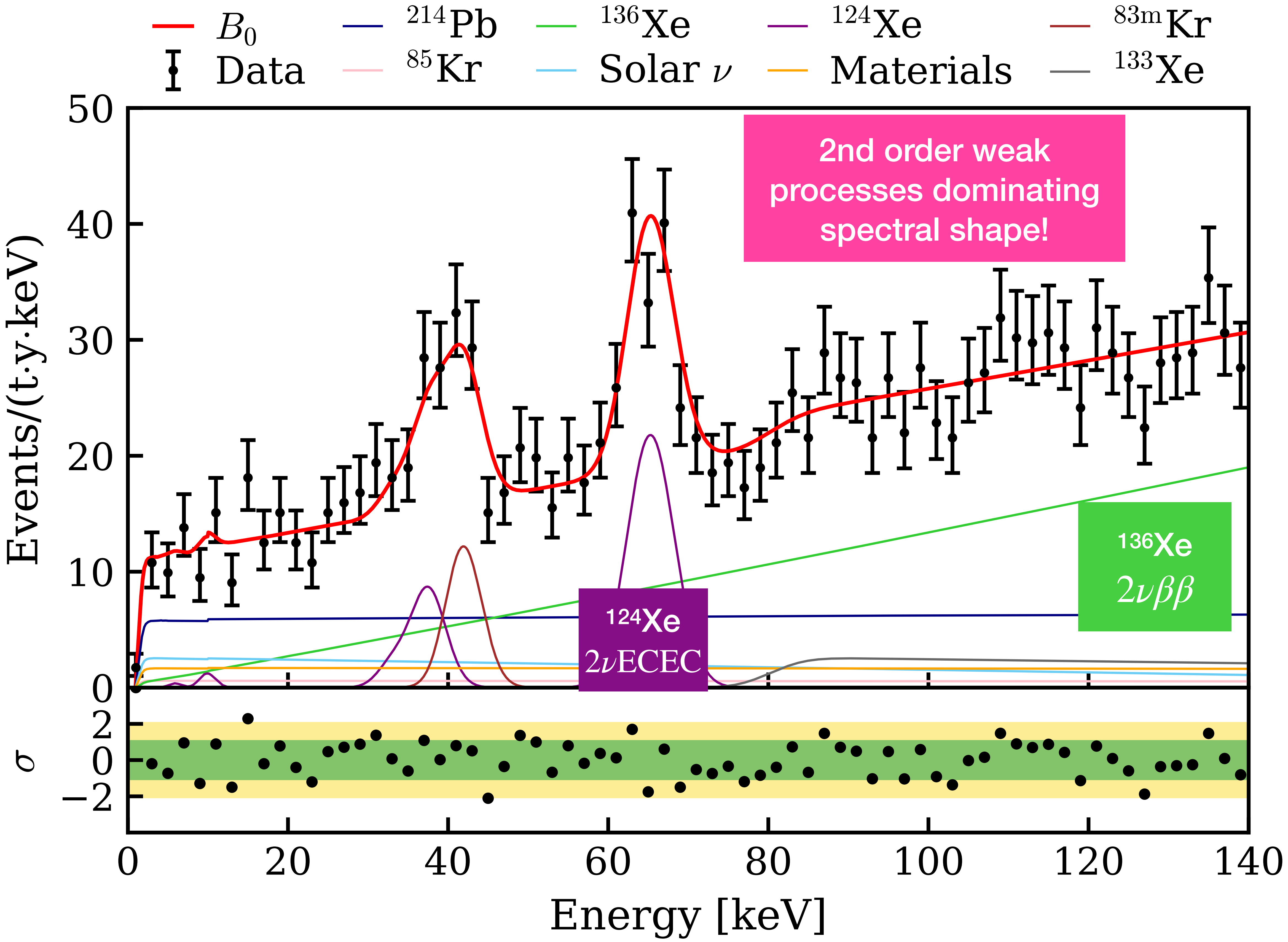
No ^3H excess in this side-band (outside the blinded SR0 data)



- The low-energy ER spectrum is dominated by ^{214}Pb at the very lowest energy, plus contributions for materials, ^{136}Xe and solar neutrinos.
- External constraints are included for
  - ^{85}Kr, 2×10^{-11} of (56 ± 36) ppq using RGMS
  - material γs, (2.1 ± 0.4) events/(t × yr × keV) from GEANT4 and screening measurements
  - ^{136}Xe from RGA and $T_{1/2}$ measurements, with a shape uncertainty
  - solar neutrinos have a 10% rate uncertainty given the Borexino measurements of the flux.
  - AC is constrained from its data-driven model

BACKGROUNDS

	Number of events in ER band	Expected < 10 keV
^{214}Pb	980 ± 120	56 ± 7
^{85}Kr	91 ± 58	5.8 ± 3.7
Materials	267 ± 51	16.2 ± 3.1
^{136}Xe	1523 ± 54	8.7 ± 0.3
Solar neutrino	298 ± 29	24.5 ± 2.4
^{124}Xe	256 ± 28	2.6 ± 0.3
Accidental coincidence	0.71 ± 0.03	0.71 ± 0.03
^{133}Xe	163 ± 63	0
^{83m}Kr	80 ± 16	0



XENONnT: the low-energy ER spectrum

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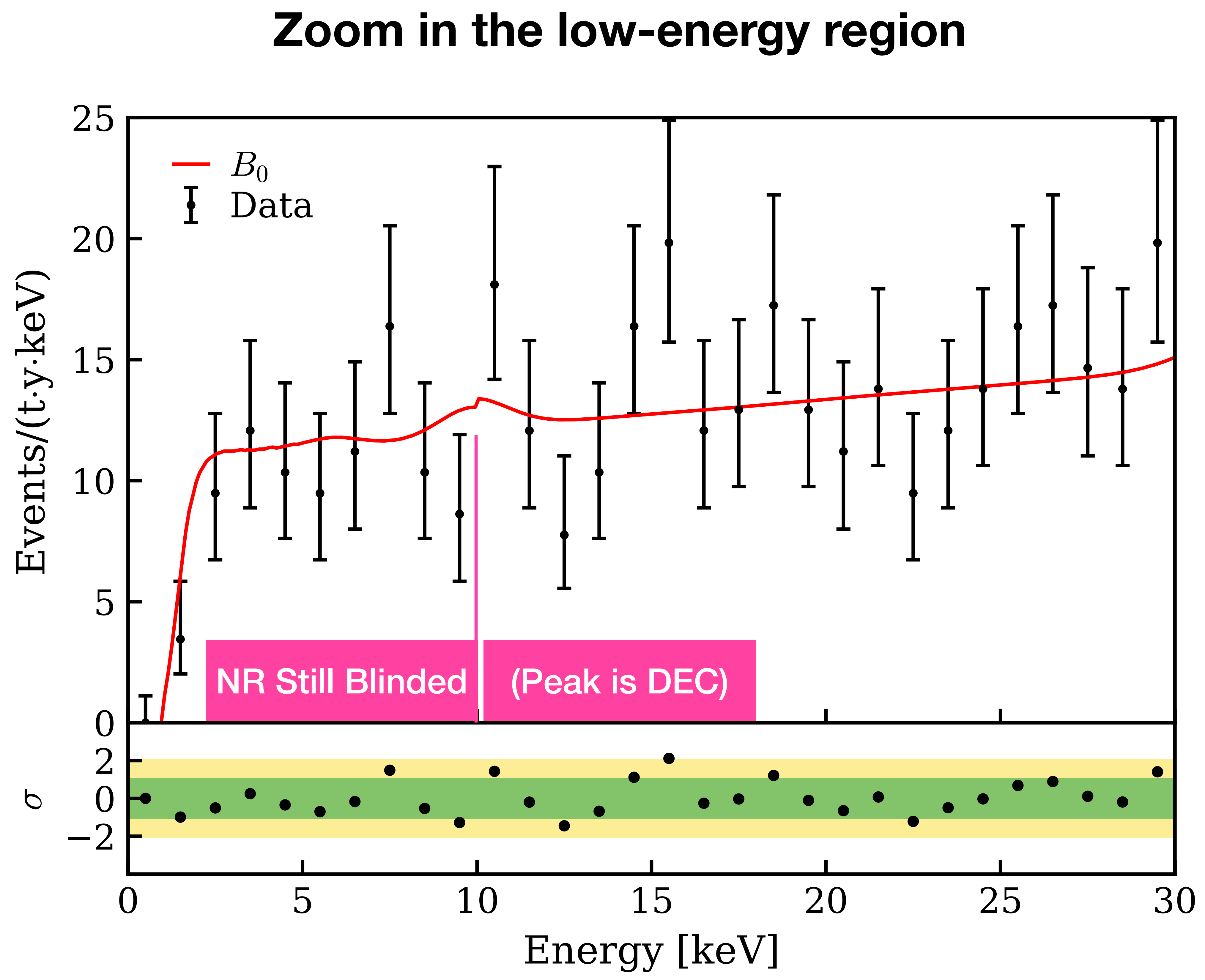

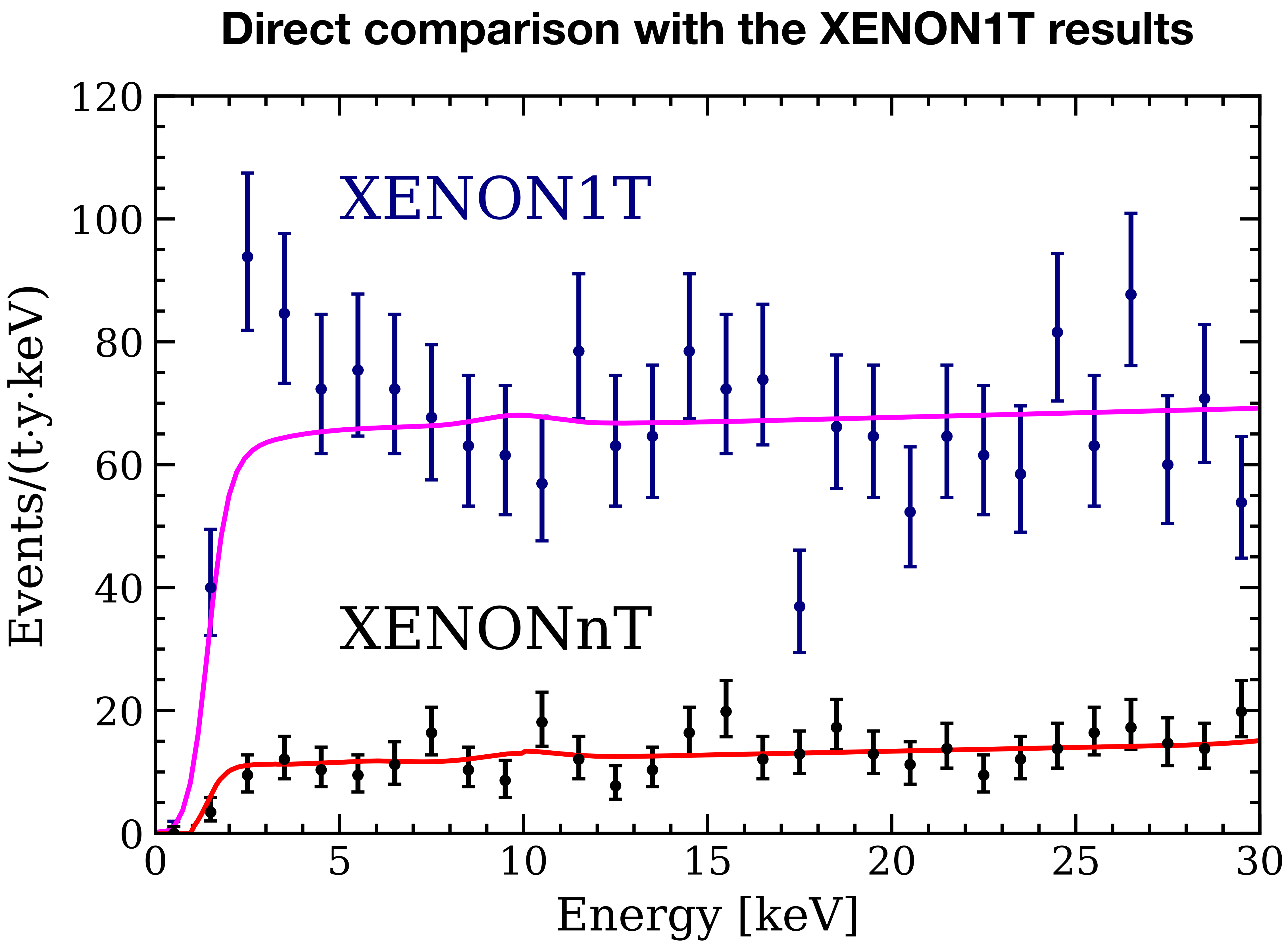

XENONnT: new limits on various channels

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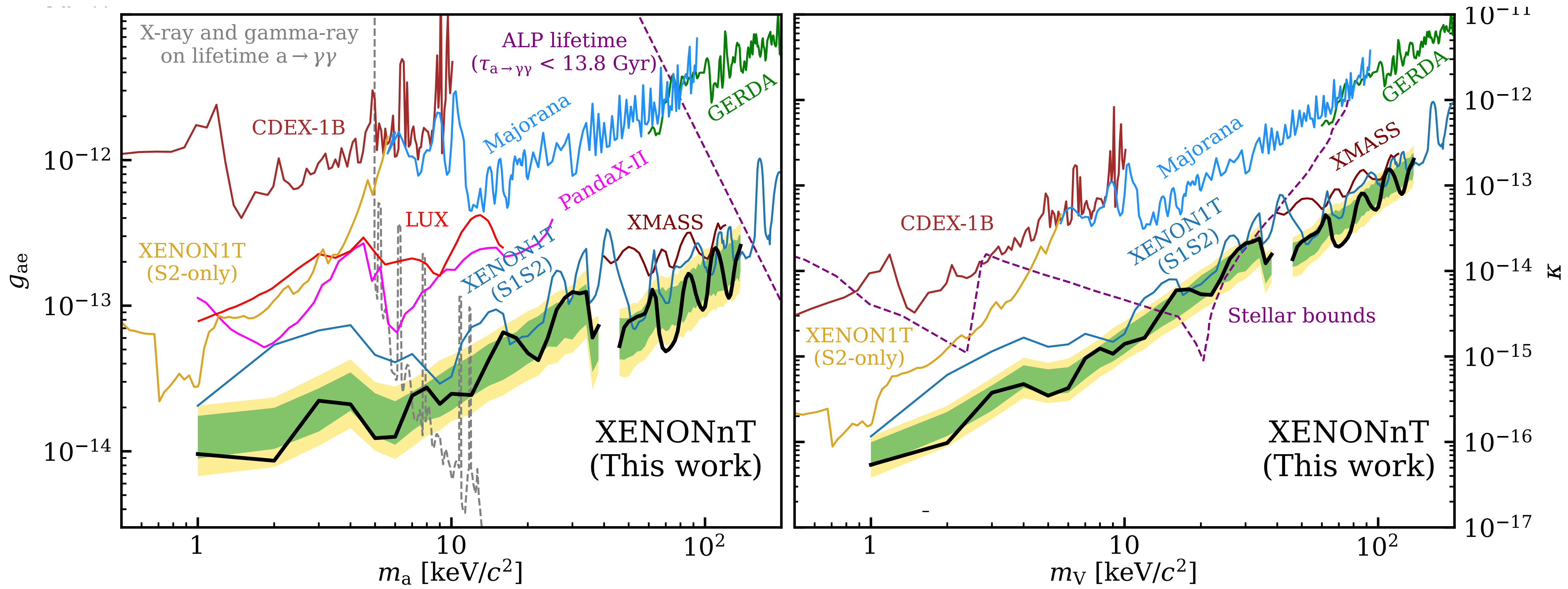
Key conclusions

Exposure: 1.16 tonne − years	$\sim \times 2$ XENON1T ER search (0.65 tonne-years)
Background rate: (16.1 ± 0.3) events/$(\mathrm{t} \times \mathrm{yr} \times \mathrm{keV})$ in 1-30 keV range	$\sim \times 0.2$ XENON1T
Best-fit signal strength: 0	XENONnT rejects a XENON1T-size peak at 8.6σ
Exclusion of XENON1T excess $(2.3\ \mathrm{keV})$ peak.	Measurements incompatible at ~4σ

Most likely explanation of XENON1T excess is a small ^3H contamination. XENONnT, taking steps to reduce tritium outgassing sees no excess

Limits on ALPs and Dark sector

ALPs | Dark γ



- A search for a peak from axion-like particles or dark photons sees no significant excess, but places new stringent limits between 1-140 keV
- Since the ^{83m}Kr rate is left unconstrained, we do not place limits at 41.5 keV

XENONnT: new limits on various channels

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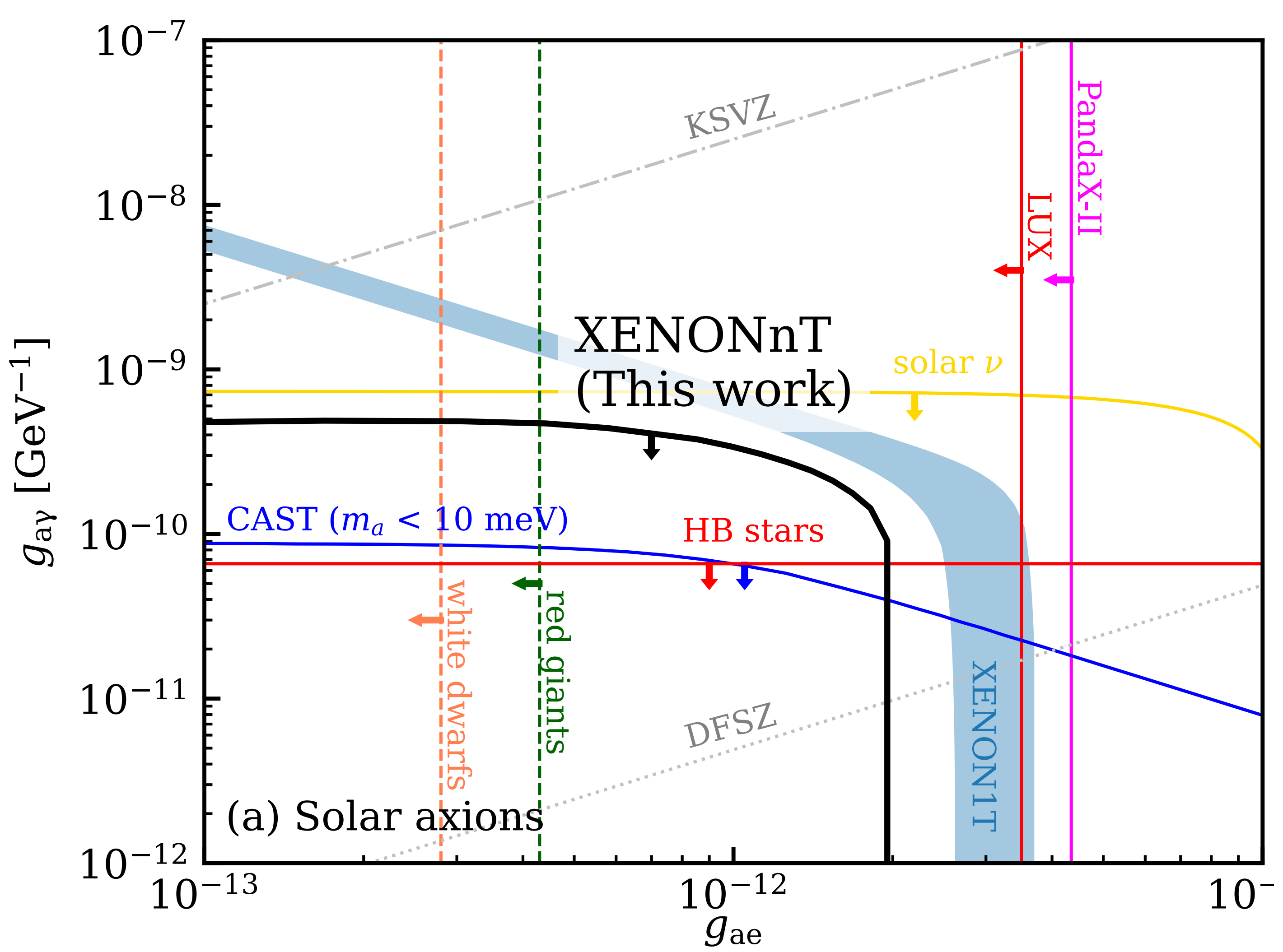
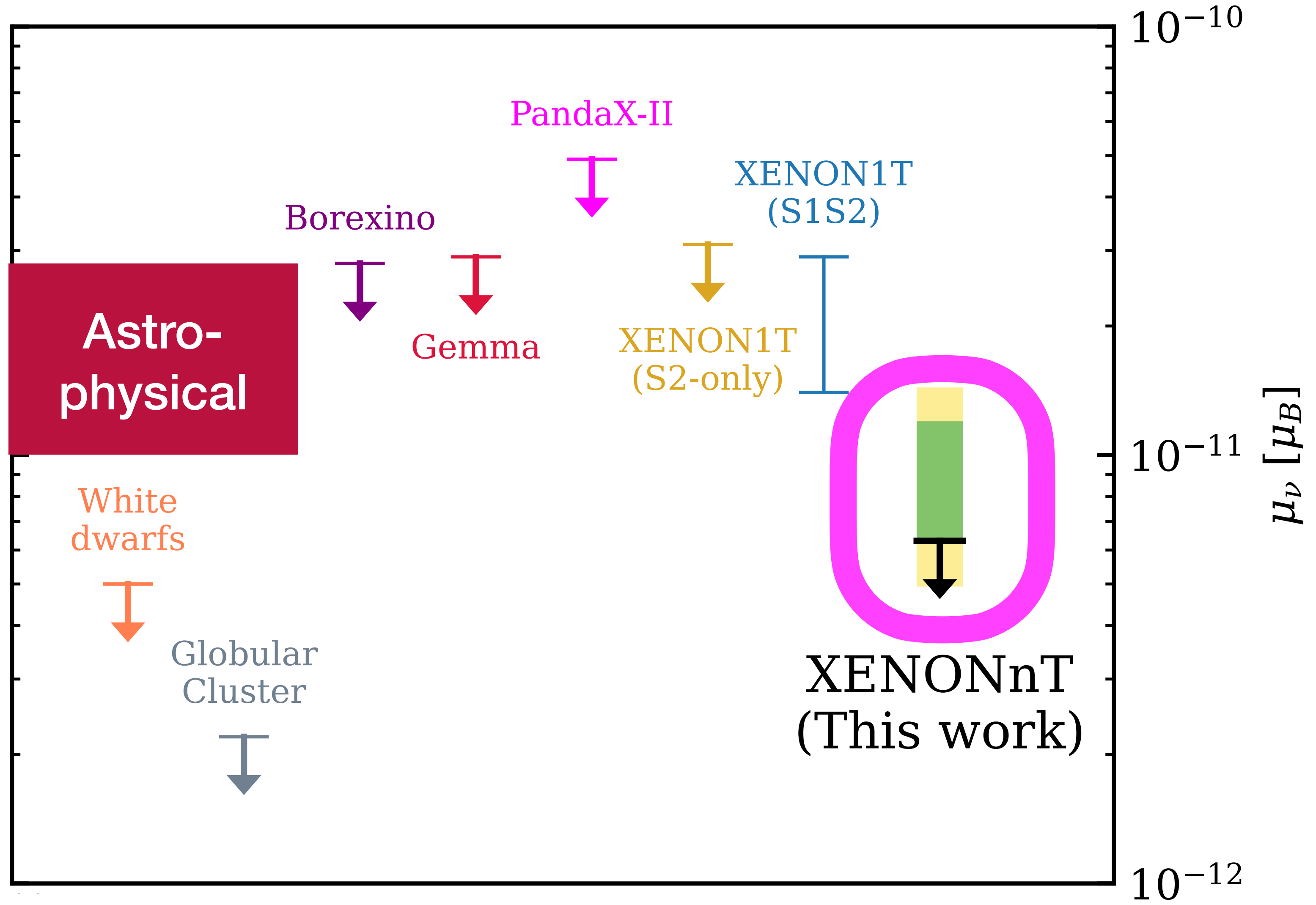
Limits on Solar Axions



- XENONnT is compatible with background-only and places new limits on the axion-electron, γ and nucleon couplings.
- Axion signal assumes axio-electric effect and reverse Primakoff effect; described by g_{ae}, $g_{a\gamma}$, g_{an}
- 90% upper limit on ^{57}Fe solar axion component is 20.4 events/$(\mathrm{t} \times \mathrm{yr})$

Limits on neutrino magnetic moment



- A magnetic moment is implied by neutrinos being massive— if new physics raises this magnetic moment, it may cause an enhanced neutrino scattering rate
- Upper limit at $\mu_\nu < 6.3 \times 10^{-12} \mu_B$

XENONnT: Summary and Conclusions

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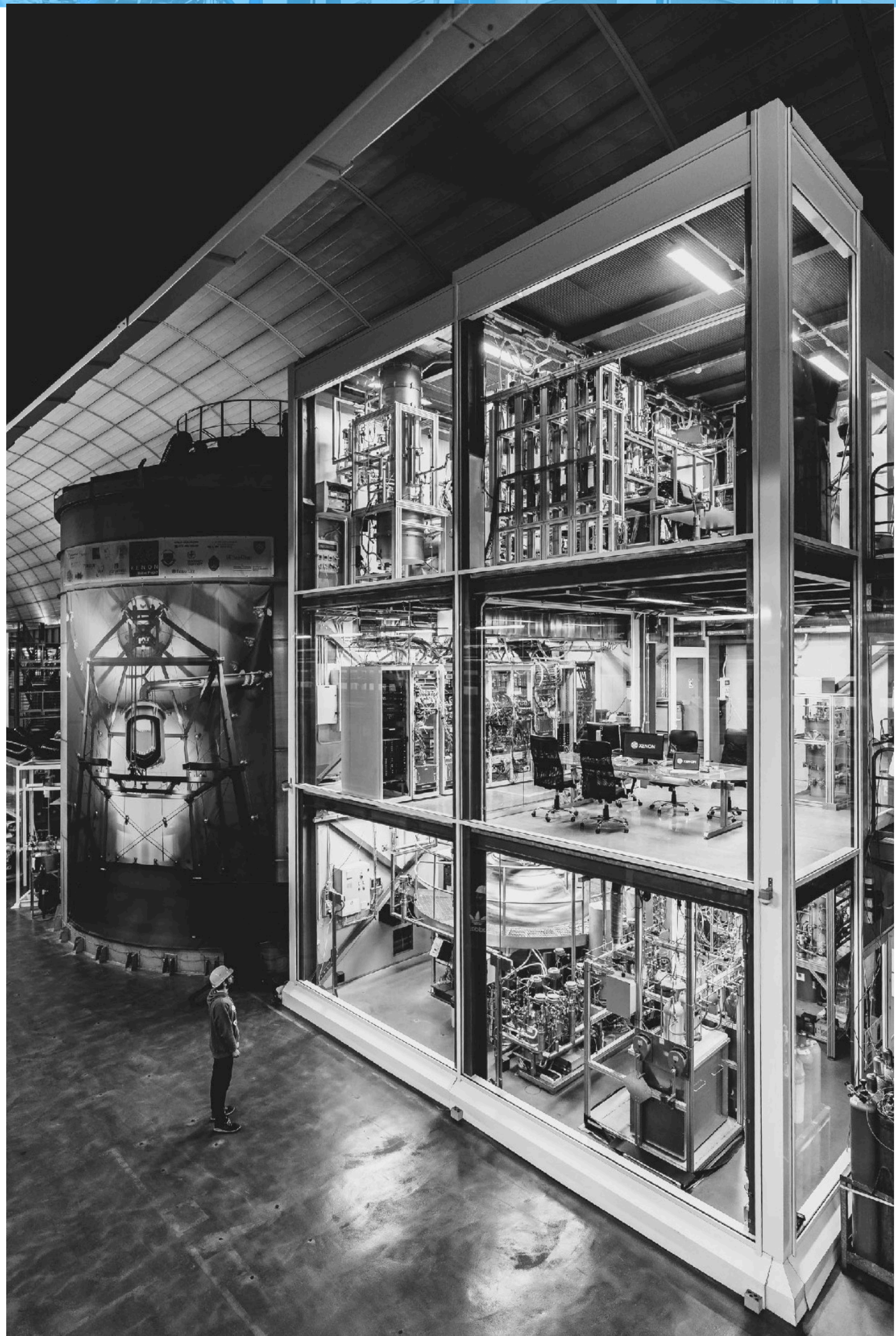
XENONnT key performances in SR0:
> 10 ms **electron lifetime,**
$1.77 \pm 0.01\ \mu\mathrm{Bq/kg}$ **radon concentration**

Blinded analysis of ER data

Excellent agreement with our background model.
Lowest ER background ever achieved in a DM experiment: (16.1 ± 0.3) events/$(\mathrm{t} \times \mathrm{yr} \times \mathrm{keV})$

No trace of ^{3}H, even in the Tritium-enhanced run

Set new best limits on Solar Axions, ν magnetic moment, ALPs, …



arXiv:2207.11330, submitted to PRL

XENONnT: next steps

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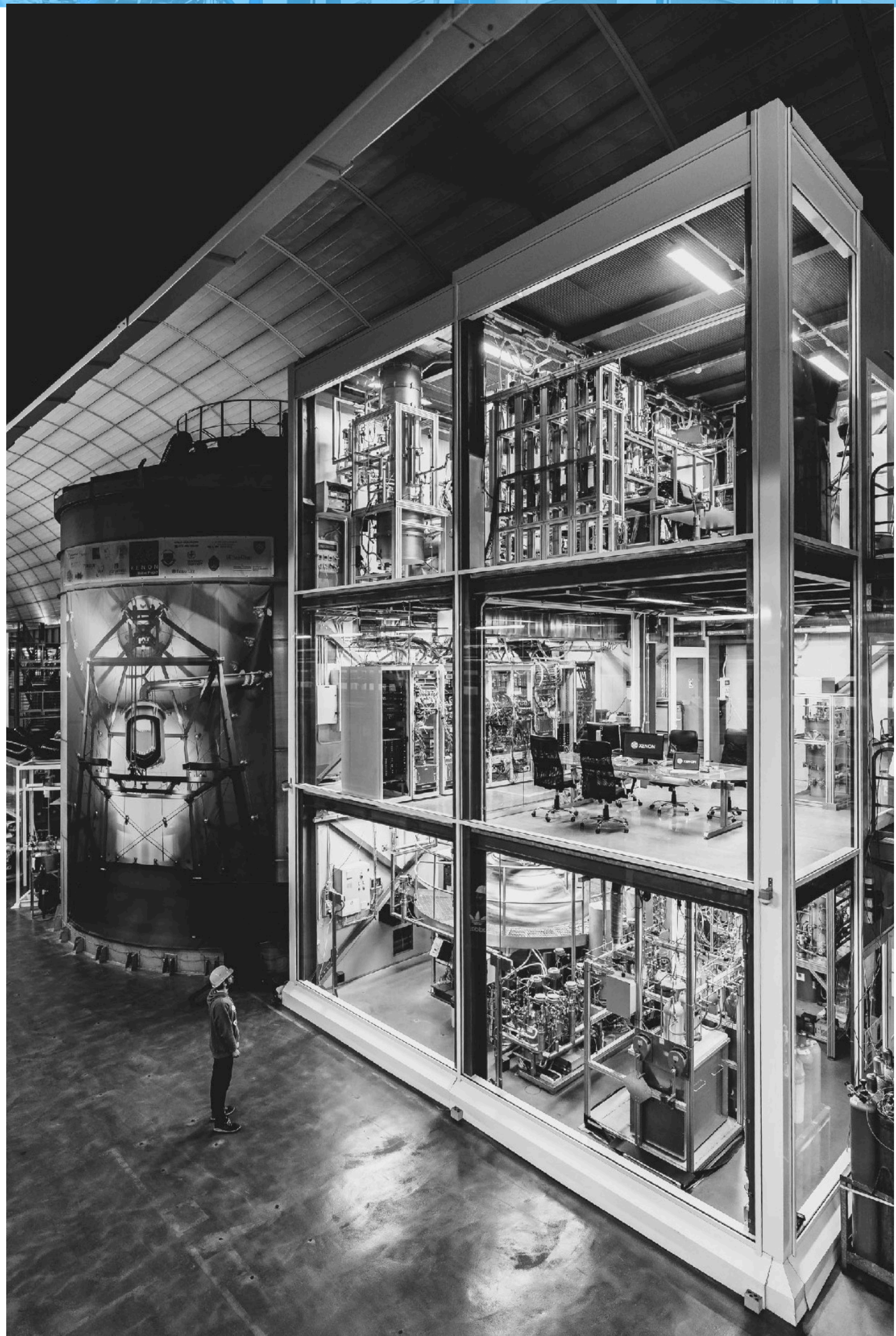
The combined liquid+gas Rn removal will further reduce the background level (already measured < 1 $\mu\mathrm{Bq/kg}$ in SR1)

Further analysis channels and deeper detector knowledge

Nuclear recoil data are still blinded
WIMP search results soon

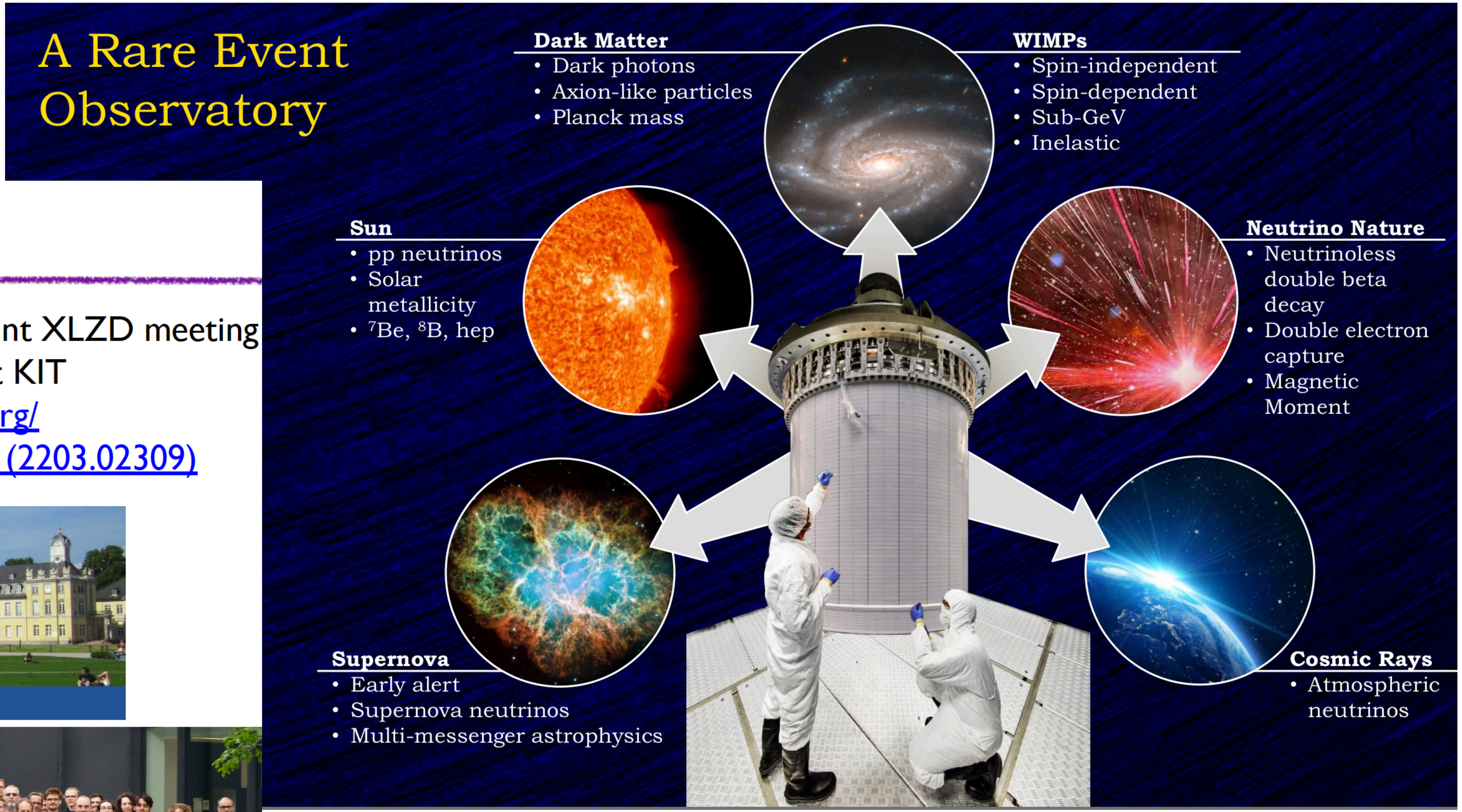


arXiv:2207.11330, submitted to PRL

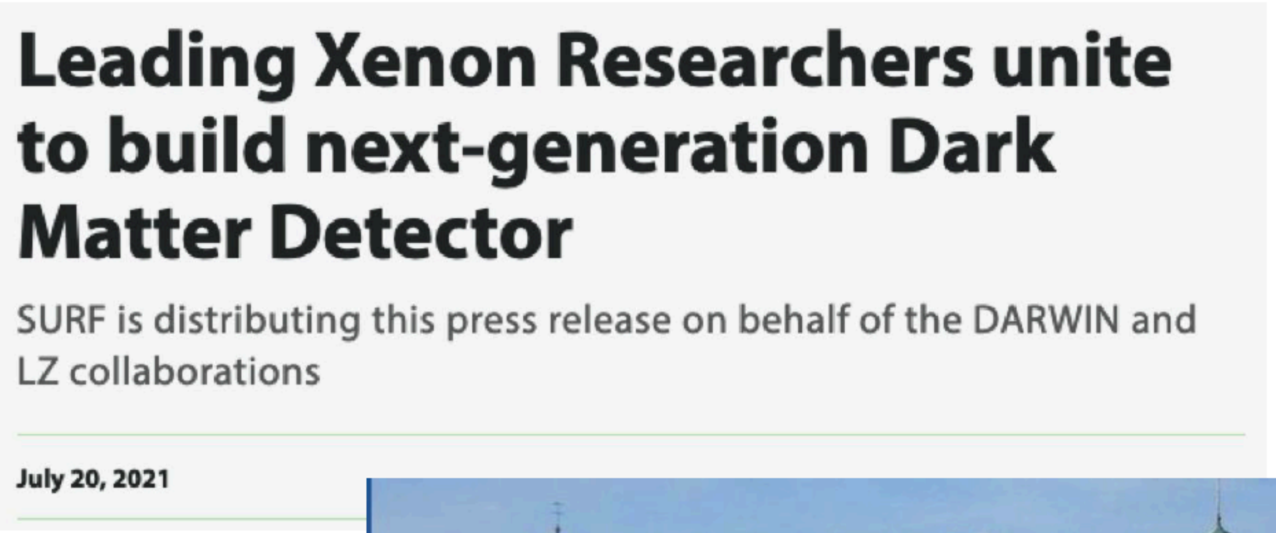
DARWIN

next step beyond XENONnT: DARWIN (via XLZD)

next phase: DARWIN



XLZD Consortium



Leading Xenon Researchers unite to build next-generation Dark Matter Detector

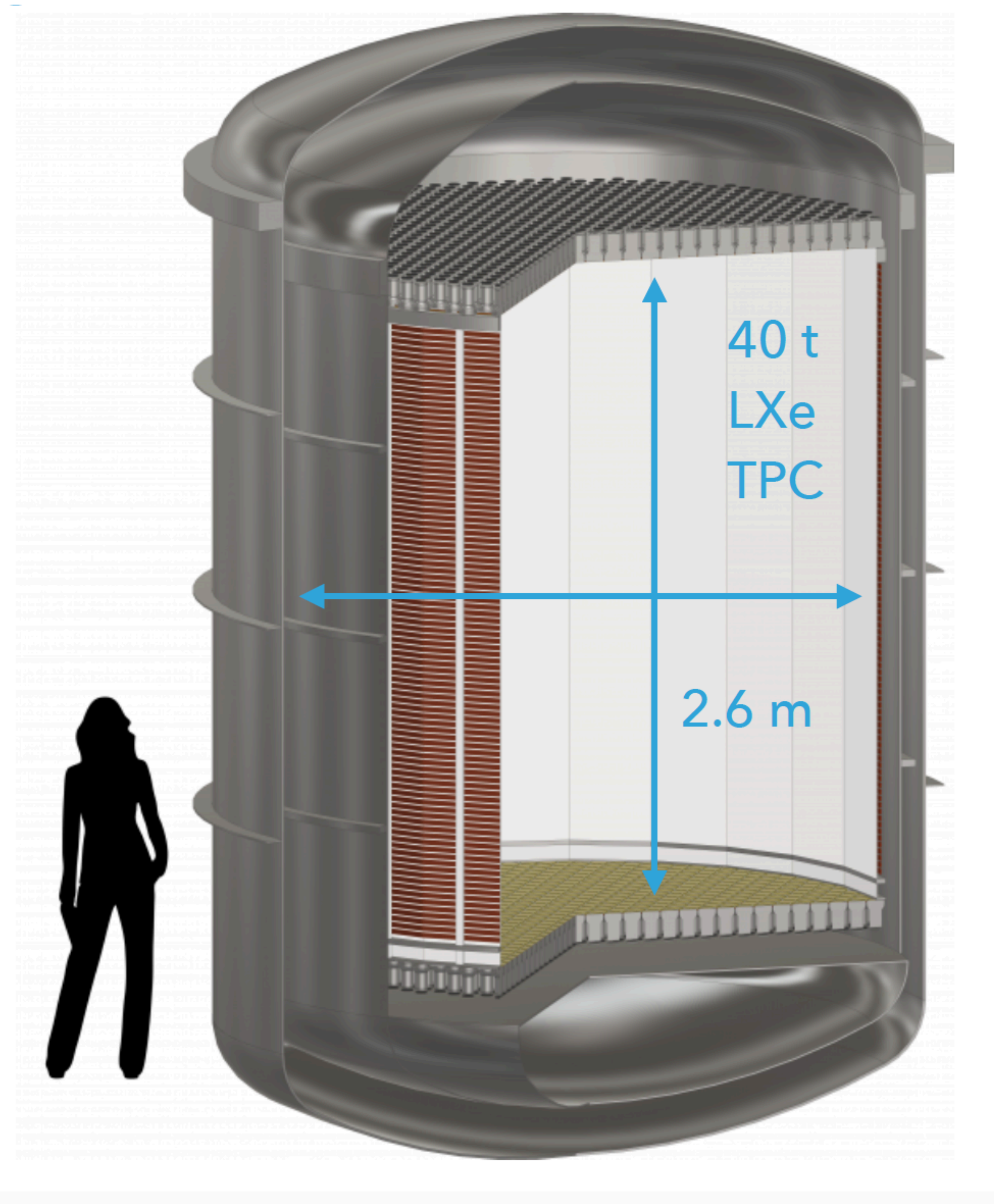
SURF is distributing this press release on behalf of the DARWIN and LZ collaborations

July 20, 2021

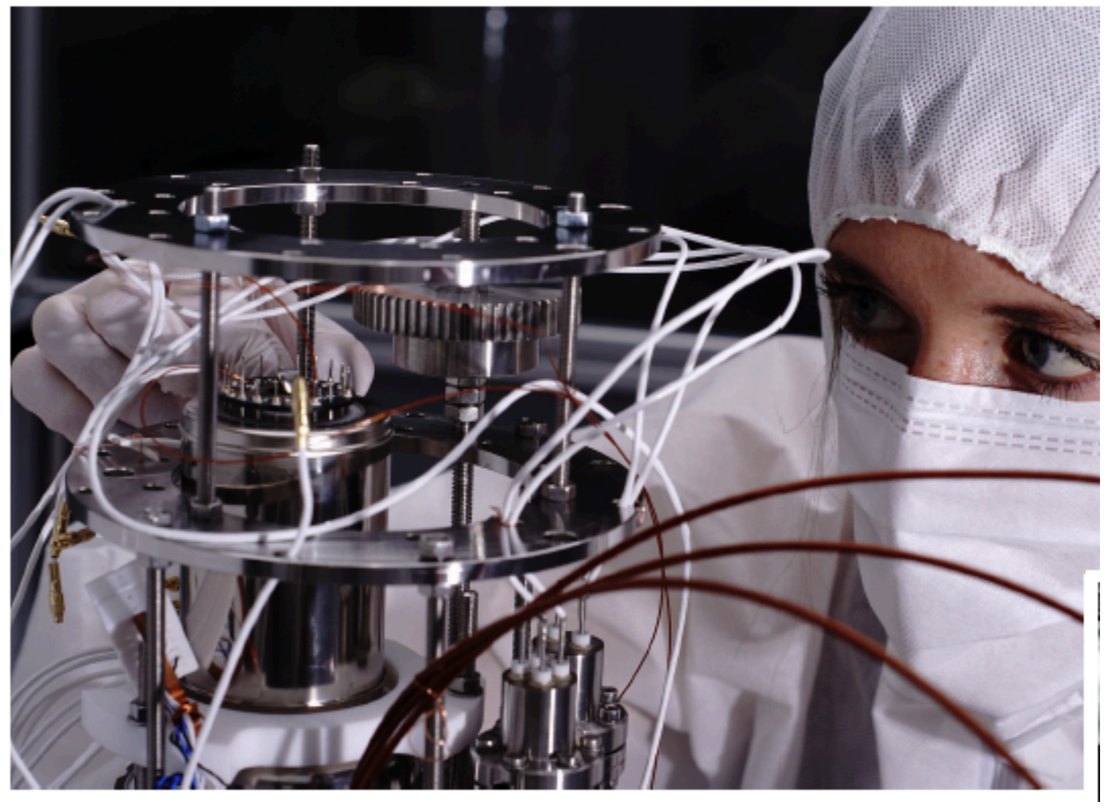
Successful joint XLZD meeting June 27-29 at KIT
https://xlzd.org/
White paper (2203.02309)

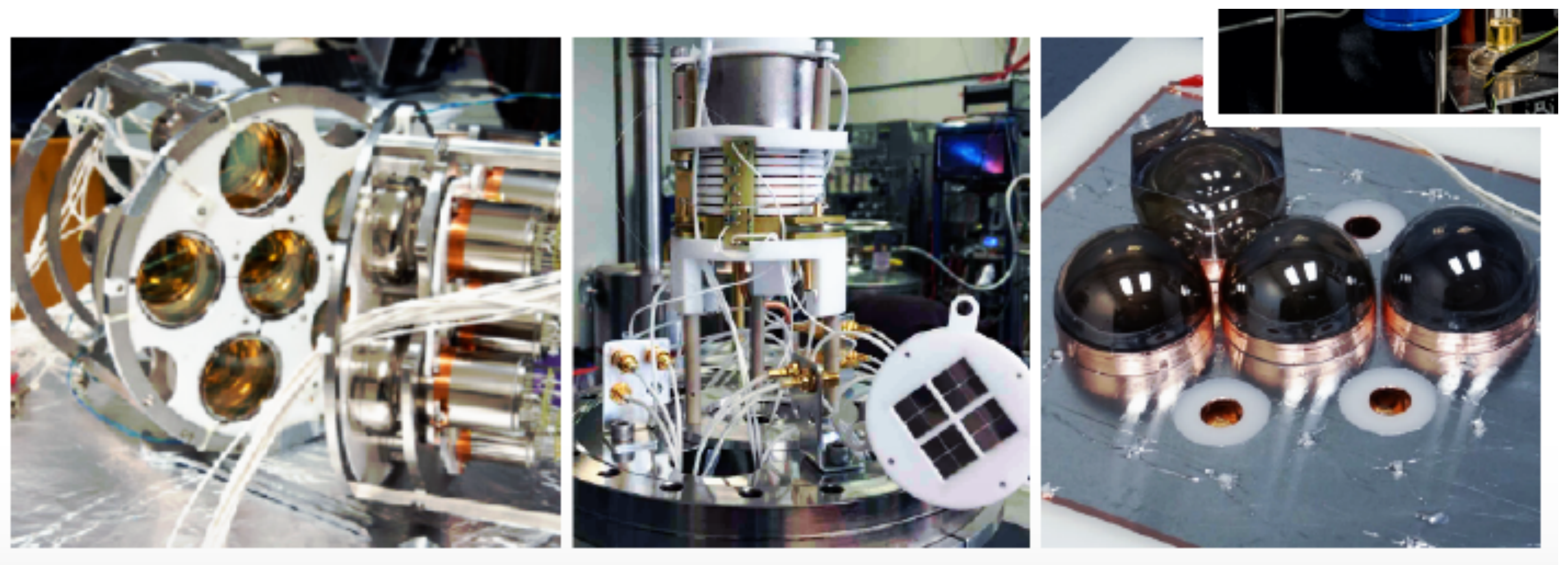
next phase: DARWIN

DARWIN LXe TPC



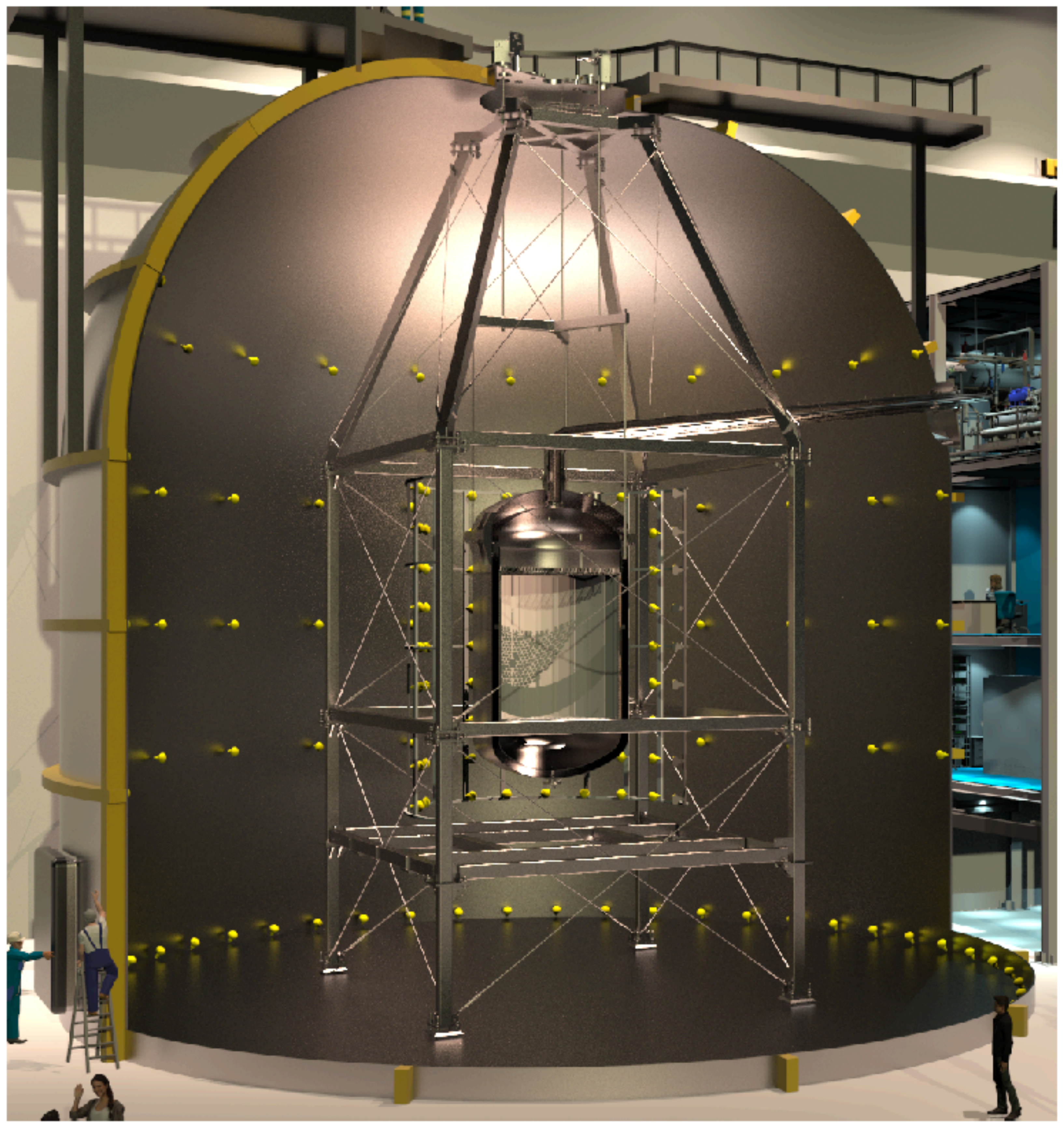
R&D on Photosensors and Electrodes





GdWater neutron veto

Visualisation of DARWIN in Borexino WT
(just an option, so far)



Direct Detection of WIMPs by 20xx ?

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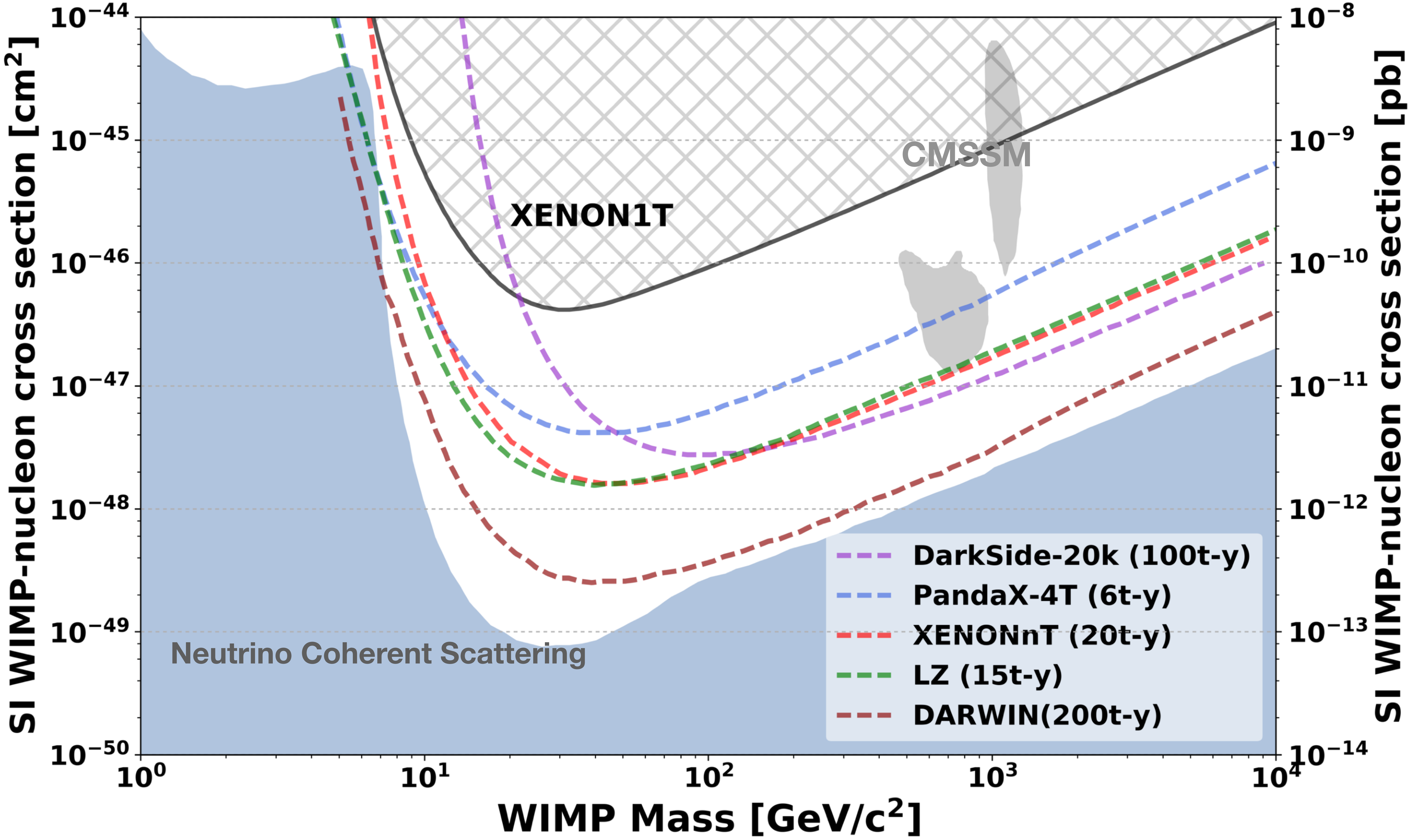


XENON PR team

Social Media

XENON

www.xenonexperiment.org
xe-pr@lngs.infn.it

facebook.com/XENONexperiment

instagram.com/xenon_experiment

twitter.com/xenonexperiment

new WebSite soon

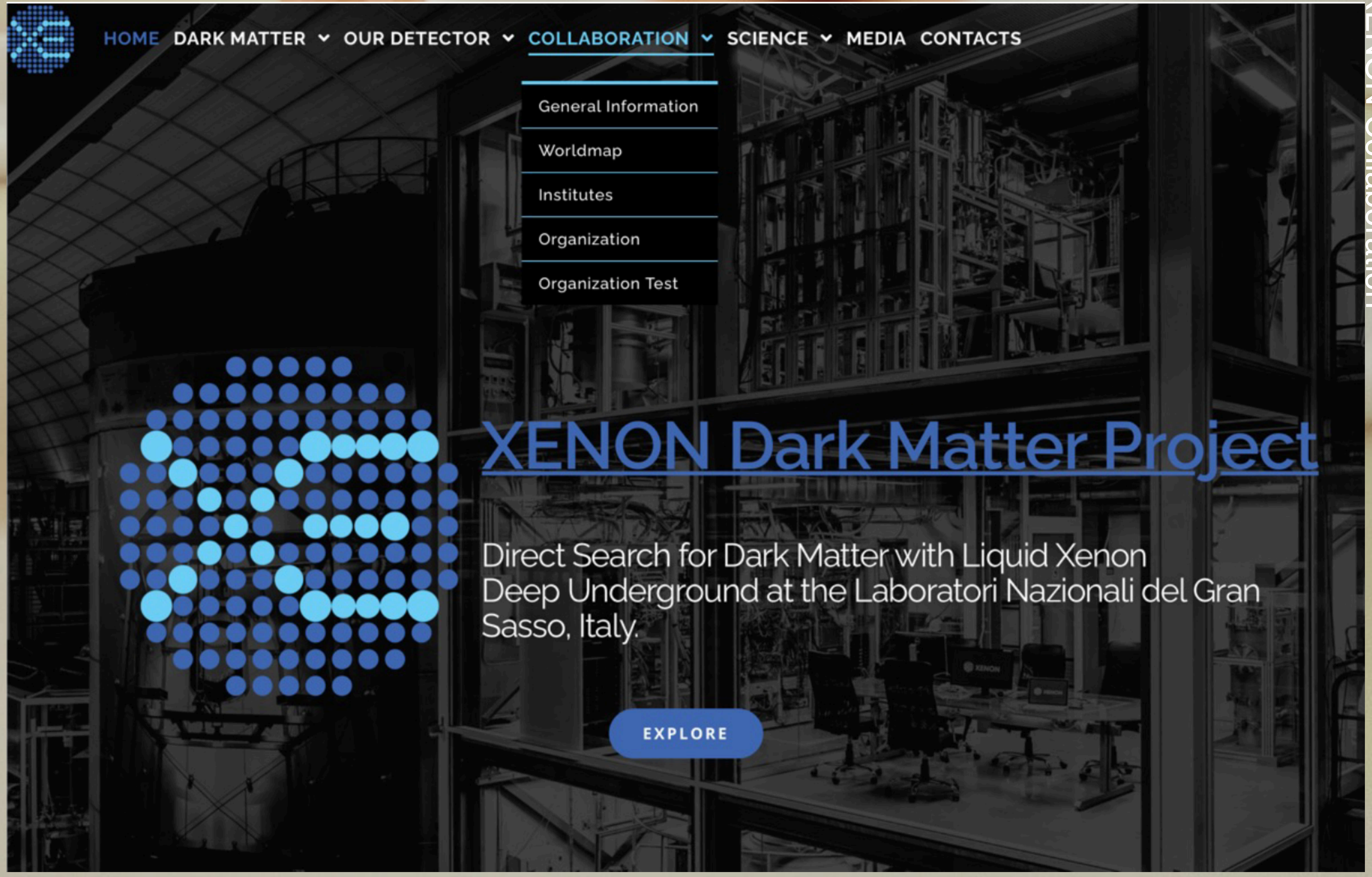
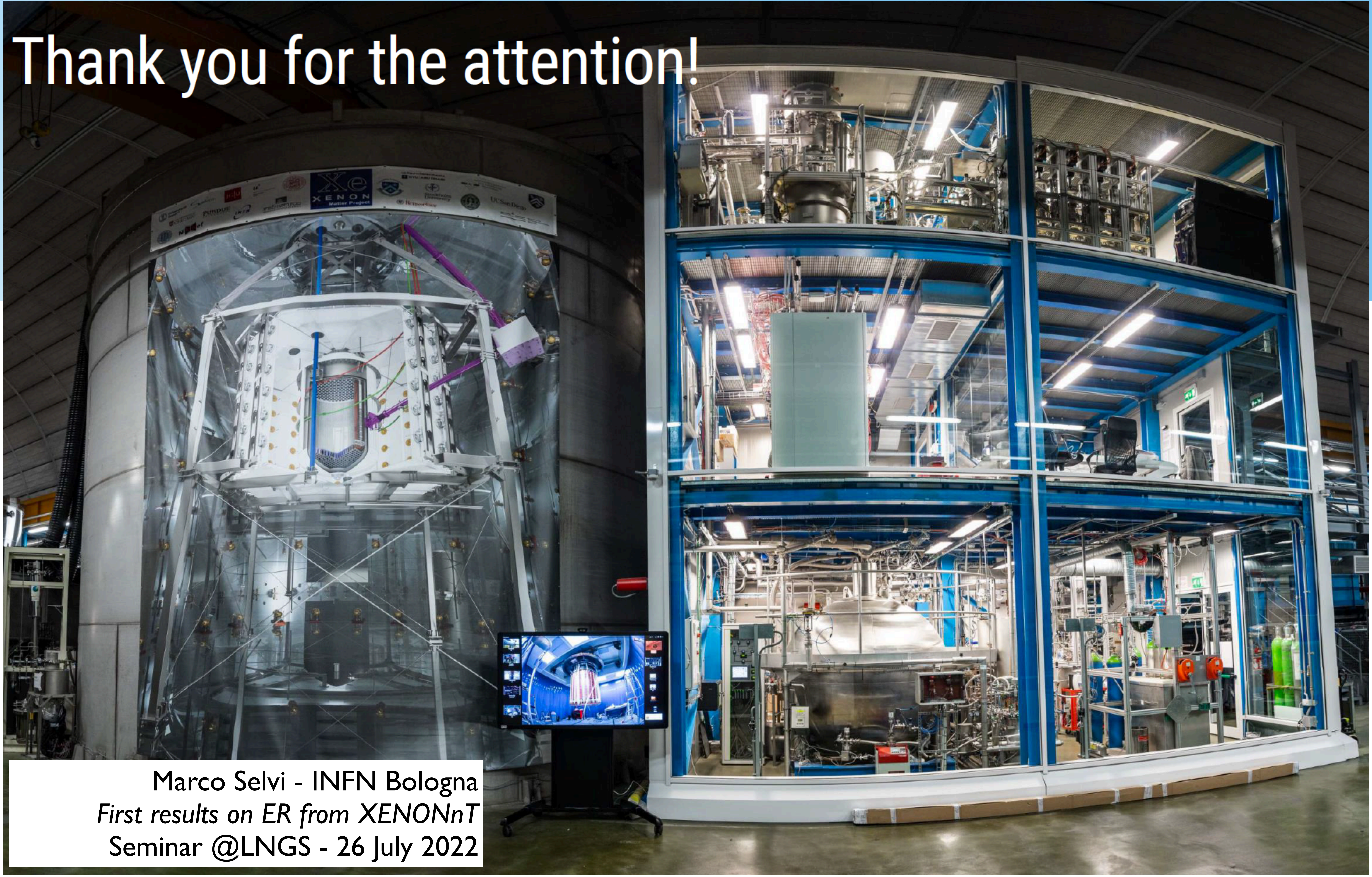


Photo credit: Luigi Di Carlo for the XENON Collaboration

Thank you for the attention!



Marco Selvi - INFN Bologna
First results on ER from XENONnT
Seminar @LNGS - 26 July 2022