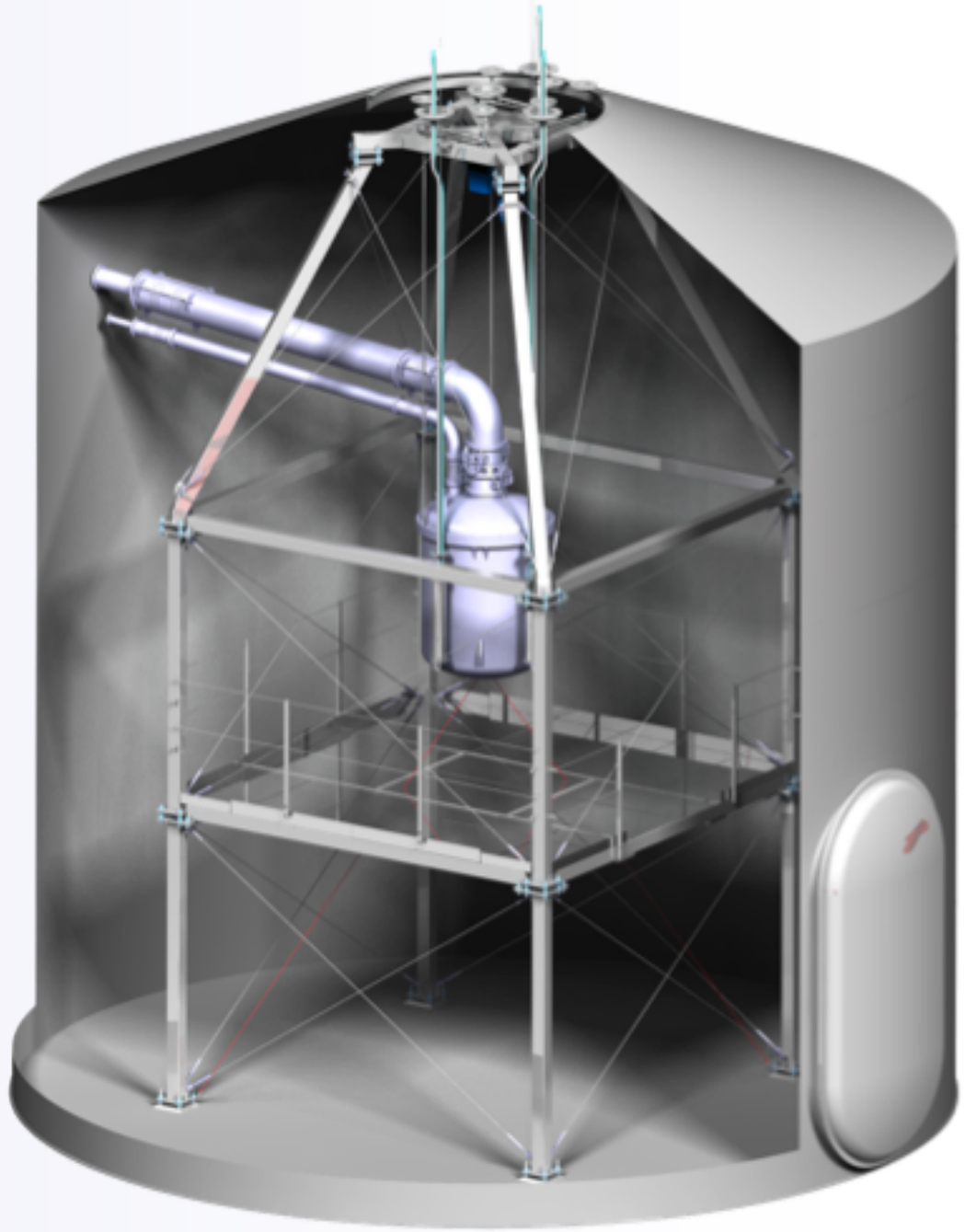
XENON10

XENON100

XENON1T

XENONnT



Dark Matter Group

XENON Dark Matter Project

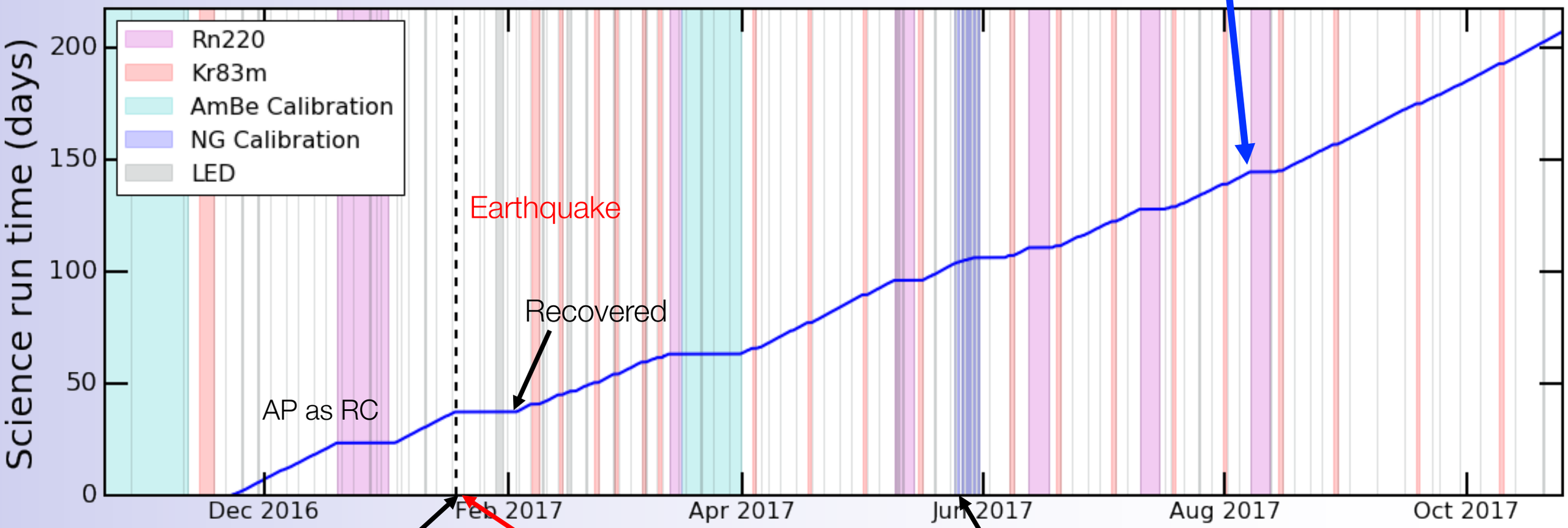
NIKHEF

Conclusions

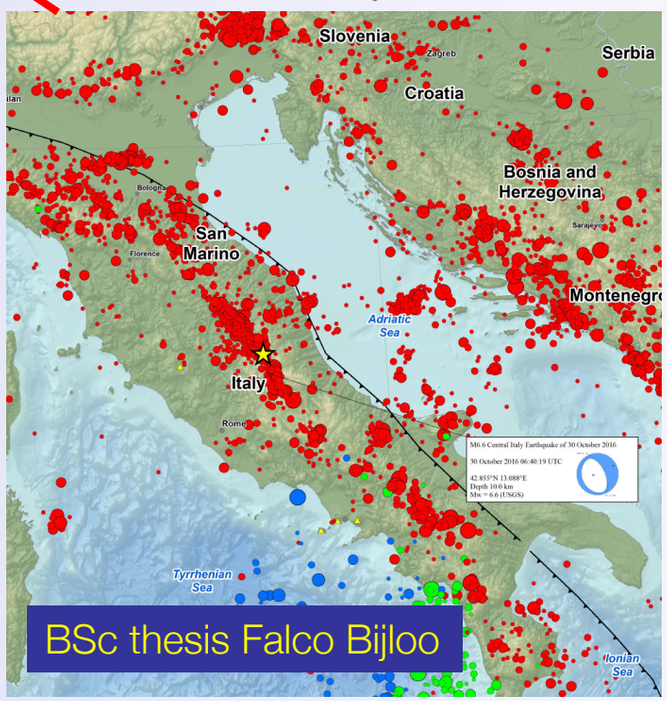
- XENON100 still producing science, but focus is now on XENON1T
- XENON1T is commissioned, characterized and ~~ready~~! running!
  - Nikhef group played an essential role in getting there
- We are about to ~~start~~ finish the ~~first~~ 2nd DM science run…
  - … and Auke-Pieter ~~is~~ was Run Coordinator
- Big thank you to the technical departments: still true
  - PDP/CT, MT and ET for their continuing support getting this experiment running
  - Marcel Vervoort for getting the neutron permits!

1 year of running

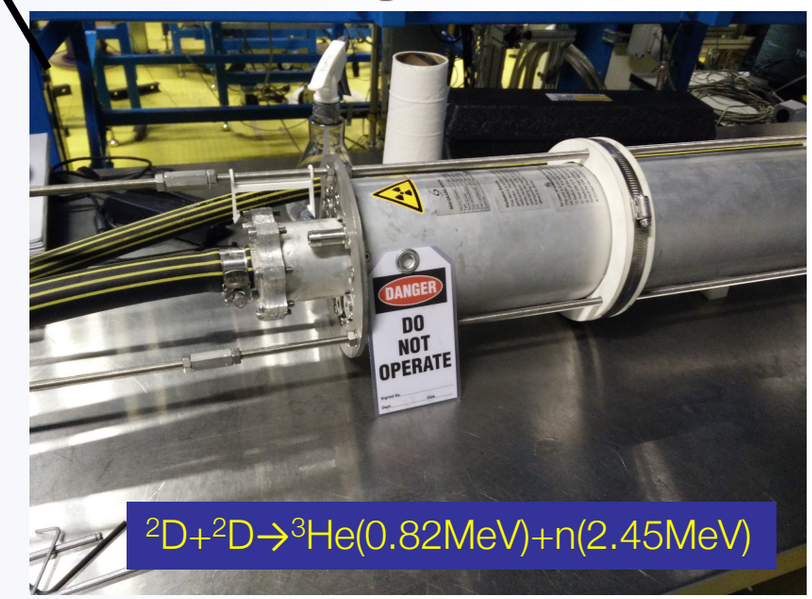
"integrated luminosity"



$H_2O+N_2+O_2$-Temperature



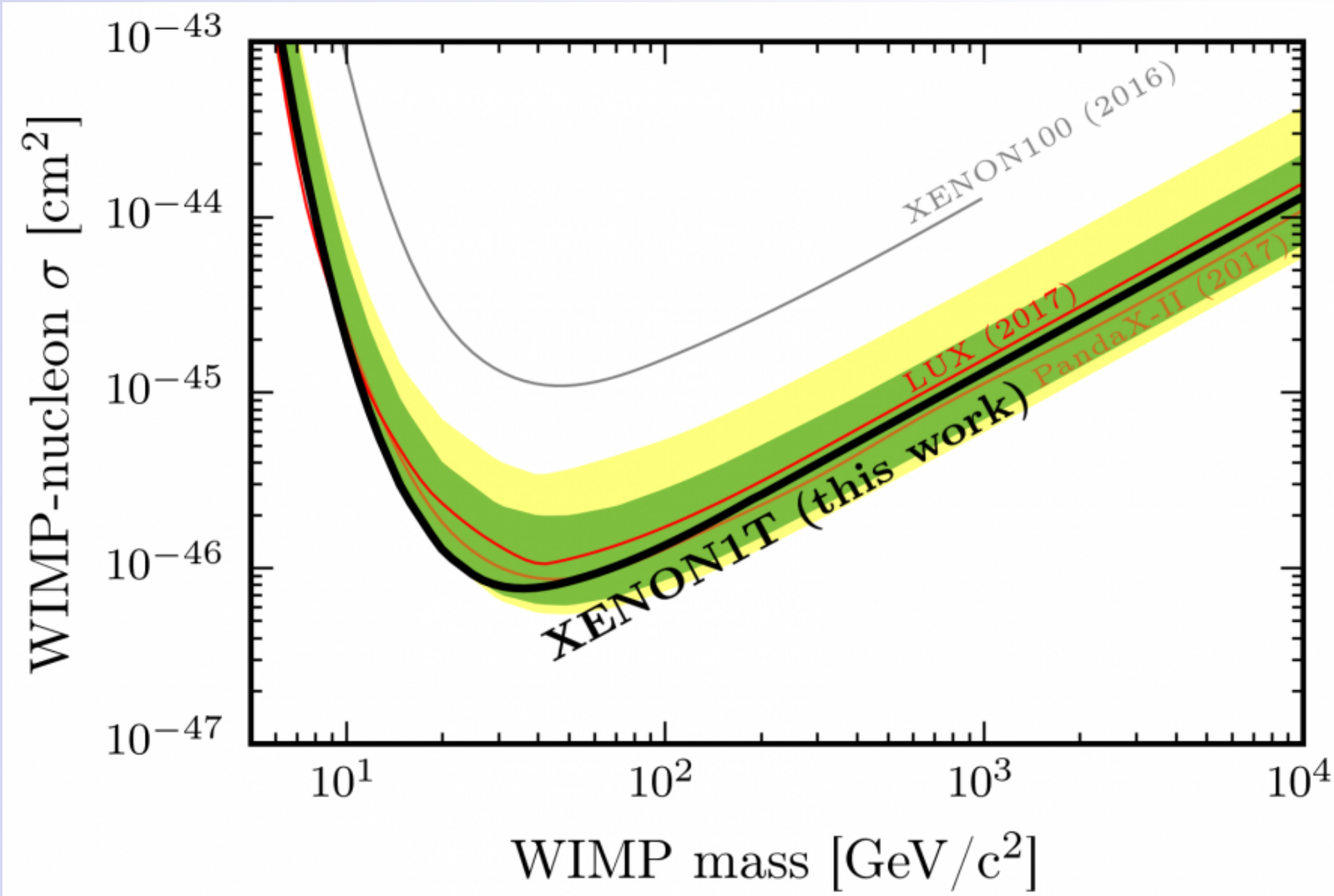
BSc thesis Falco Bijloo



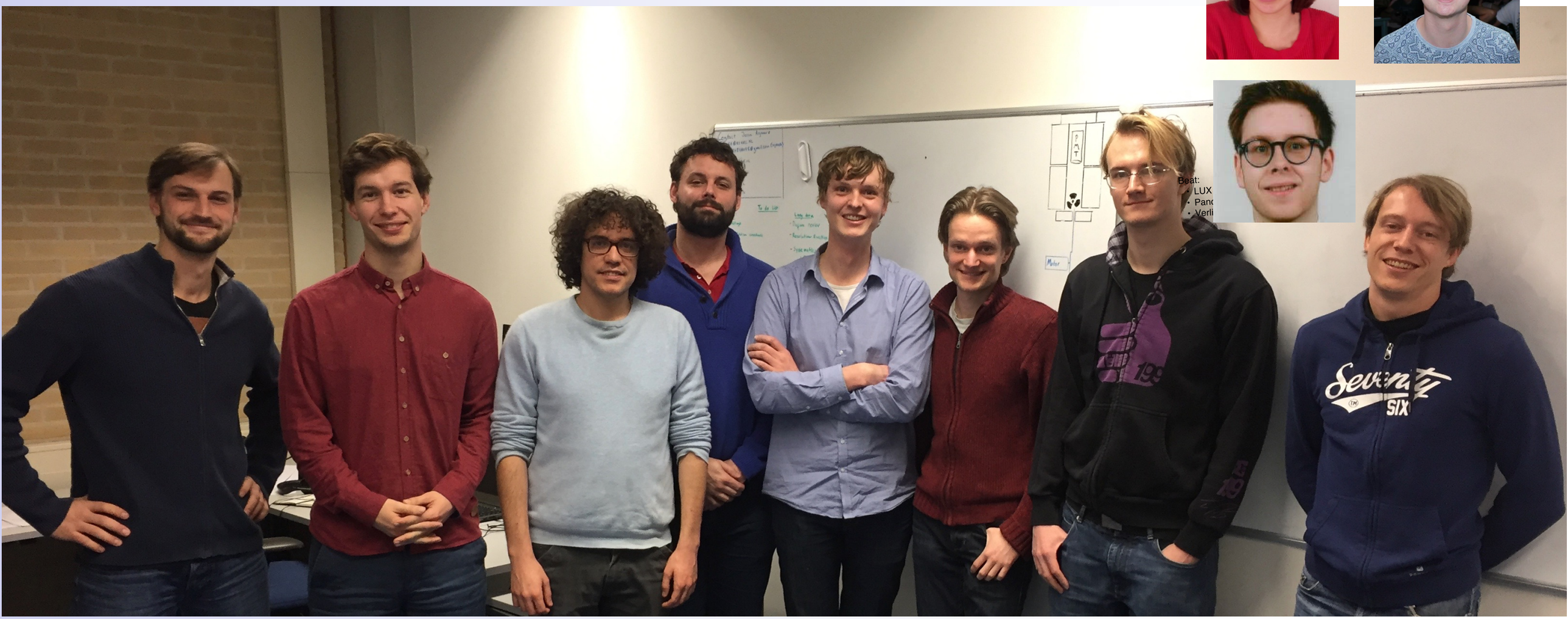
$^2D+^2D \rightarrow ^3He(0.82MeV)+n(2.45MeV)$

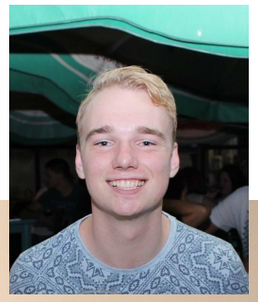
First results from XENON1T – Sander's talk

Large Nikhef stamp on analysis: Andrew, Jelle, Erik, Sander



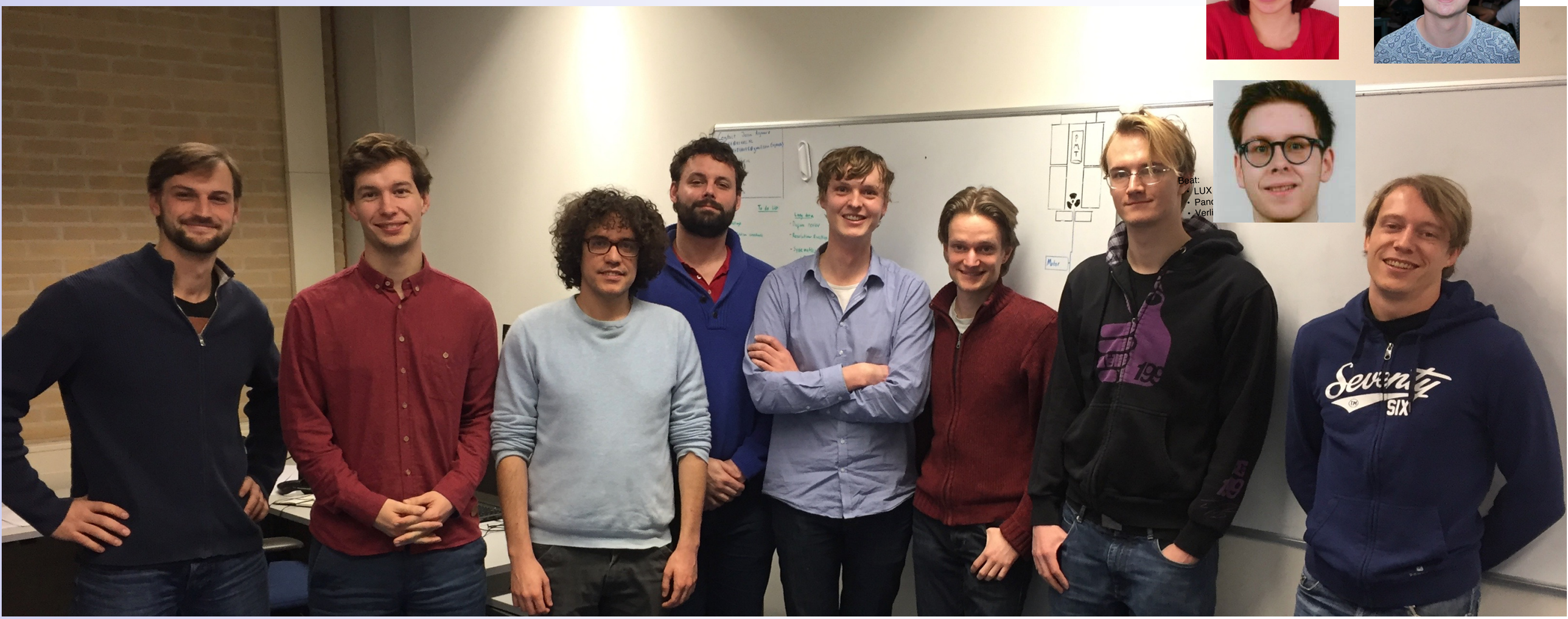
DM team

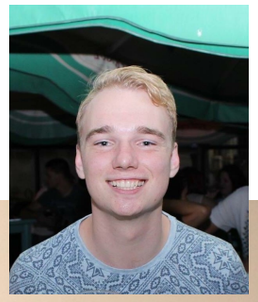




Sorry Katherine

DM team





“beantwoordt interessante vragen uit het publiek”

Sorry Katherine

What came out?

neutrons - Erik

Nuclear Inst. and Methods in Physics Research, A 879 (2018) 31–38

Contents lists available at ScienceDirect

Nuclear Inst. and Methods in Physics Research, A

journal homepage: www.elsevier.com/locate/nima

Characterization of a deuterium–deuterium plasma fusion neutron generator

R.F. Lang [a], J. Pienaar [a,*], E. Hogenbirk [c], D. Masson [a], R. Nolte [b], A. Zimbal [b], S. Röttger [b], M.L. Benabderrahmane [e], G. Bruno [d]

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[b] Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
[c] Nikhef and the University of Amsterdam, Science Park, Amsterdam, The Netherlands
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ARTICLE INFO

Keywords:
Neutron generator
Deuterium–deuterium fusion
Inertial electrostatic confinement

ABSTRACT

We characterize the neutron output of a deuterium–deuterium plasma fusion neutron generator, model 35-DD-W-S, manufactured by NSD/Gradel-Fusion. The measured energy spectrum is found to be dominated by neutron peaks at 2.2 MeV and 2.7 MeV. A detailed GEANT4 simulation accurately reproduces the measured energy spectrum and confirms our understanding of the fusion process in this generator. Additionally, a contribution of 14.1 MeV neutrons from deuterium–tritium fusion is found at a level of 3.5%, from tritium produced in previous deuterium–deuterium reactions. We have measured both the absolute neutron flux as well as its relative variation on the operational parameters of the generator. We find the flux to be proportional to voltage $V^{3.32\pm0.14}$ and current $I^{0.97\pm0.01}$. Further, we have measured the angular dependence of the neutron emission with respect to the polar angle. We conclude that it is well described by isotropic production of neutrons within the cathode field cage.

Jelle as corresponding author

Featured in Physics | Editors' Suggestion | Open Access

First Dark Matter Search Results from the XENON1T Experiment

E. Aprile *et al.* (XENON Collaboration)
Phys. Rev. Lett. **119**, 181301 – Published 30 October 2017

Physics See Viewpoint: The Relentless Hunt for Dark Matter

MSc theses: J. Angevaare, A. Wildeboer, K. Teutem

BSc theses: E. Abram, F. Bijloo, D. Wernik PhD thesis: A. Tiseni – defence 12-01-2018

AP as corresponding author

The XENON1T Dark Matter Experiment

XENON Collaboration: E. Aprile, J. Aalbers, F. Agostini, M. Alfonsi, F. D. Amaro, M. Anthony, B. Antunes, F. Arneodo, M. Balata, P. Barrow, L. Baudis, B. Bauermeister, M. L. Benabderrahmane, T. Berger, A. Breskin, P. A. Breur, A. Brown, E. Brown, S. Bruenner, G. Bruno, R. Budnik, L. Bütikofer, J. Calvén, J. M. R. Cardoso, M. Cervantes, A. Chiarini, D. Cichon, D. Coderre, A. P. Colijn, J. Conrad, R. Corrieri, J. P. Cussonneau, M. P. Decowski, P. de Perio, P. Di Gangi, A. Di Giovanni, S. Diglio, J.-M. Disdier, M. Doets, E. Duchovni, G. Eurin, J. Fei, A. D. Ferella, A. Fieguth, D. Florin, D. Front, W. Fulgione, A. Gallo Rosso, M. Galloway, F. Gao, M. Garbini, C. Geis, K.-L. Giboni, L. W. Goetzke, L. Grandi, Z. Greene, C. Grignon, C. Hasterok, E. Hogenbirk, C. Huhmann, R. Itay, A. James, B. Kaminsky, S. Kazama, G. Kessler, A. Kish, H. Landsman, R. F. Lang, D. Lellouch, L. Levinson, Q. Lin, S. Lindemann, M. Lindner, F. Lombardi, J. A. M. Lopes, R. Maier, A. Manfredini, I. Maris, T. Marrodán Undagoitia, J. Masbou, F. V. Massoli, D. Masson, D. Mayani, M. Messina, K. Micheneau, A. Molinario, K. Morå, M. Murra, J. Naganoma, K. Ni, U. Oberlack, D. Orlandi, R. Othegraven, P. Pakarha, S. Parlati, B. Pelssers, R. Persiani, F. Piastra, J. Pienaar, V. Pizzella, M.-C. Piro, G. Plante, N. Priel, D. Ramírez García, L. Rauch, S. Reichard, C. Reuter, A. Rizzo, S. Rosendahl, N. Rupp, J. M. F. dos Santos, R. Saldahna, G. Sartorelli, M. Scheibelhut, S. Schindler, J. Schreiner, M. Schumann, L. Scotto Lavina, M. Selvi, P. Shagin, E. Shockley, M. Silva, H. Simgen, M. v. Sivers, M. Stern, A. Stein, D. Tatananni, L. Tatananni, D. Thers, A. Tiseni, G. Trinchero, C. Tunnell, N. Upole, M. Vargas, O. Wack, R. Walet, H. Wang, Z. Wang, Y. Wei, C. Weinheimer, C. Wittweg, J. Wulf, J. Ye, Y. Zhang (collapse list)

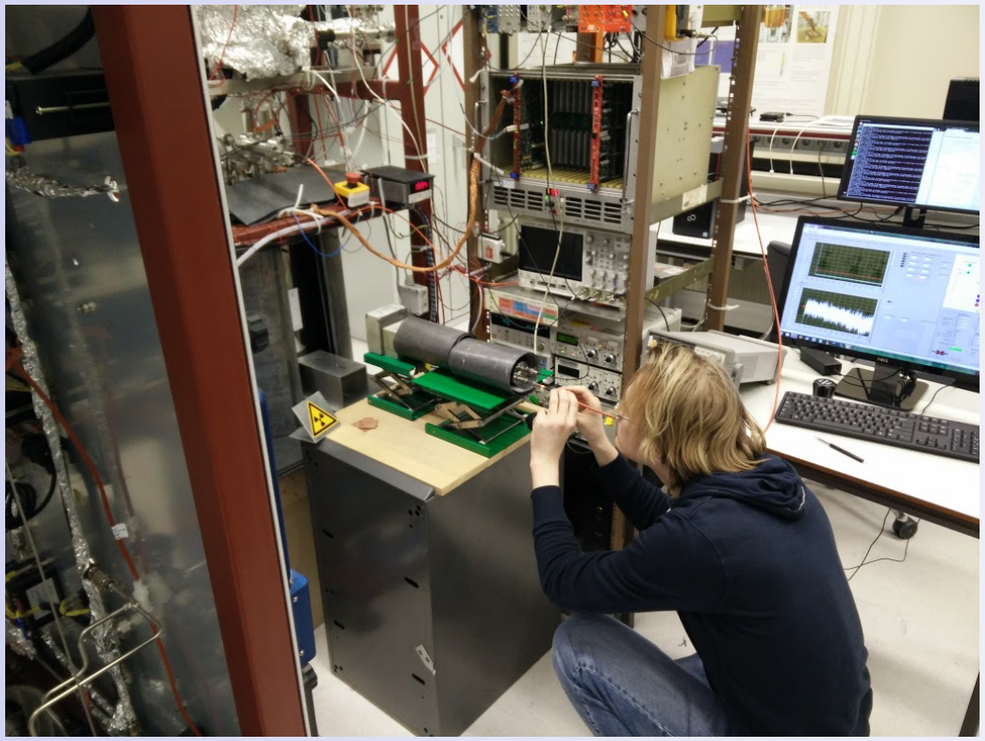
(Submitted on 23 Aug 2017)

Patrick as Ed Board chair

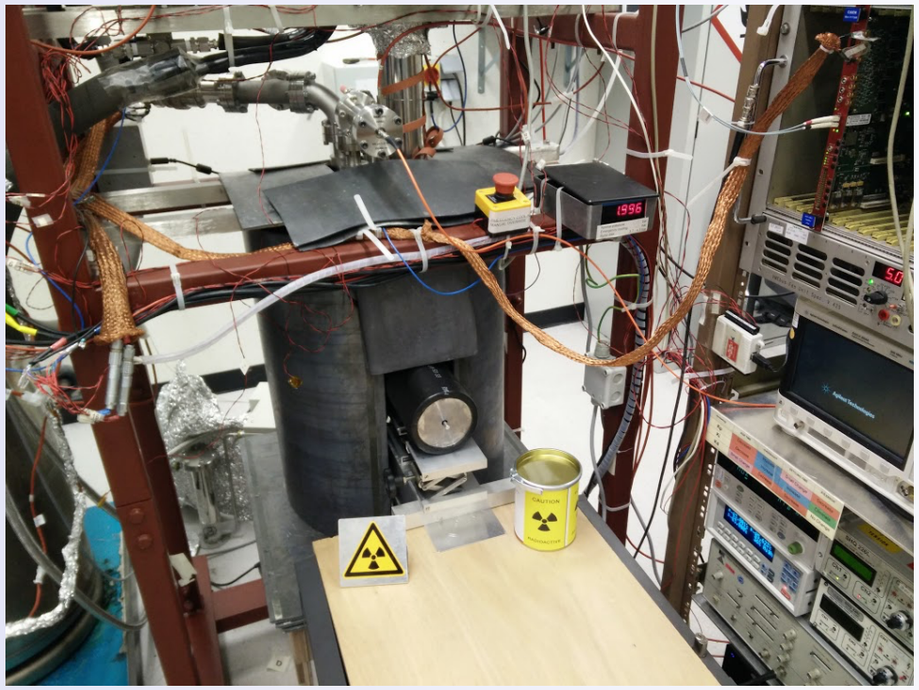
Published XENON100 Papers

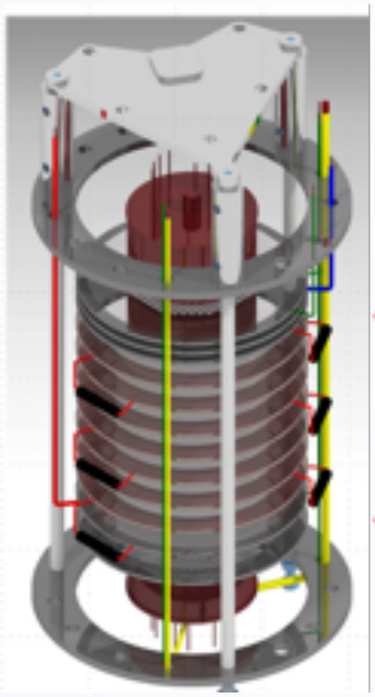
- 2017-12-07: Search for Bosonic Super-WIMP Interactions with the XENON100 Experiment, 1709.02222, EB page
  cite as: *XENON100, Phys. Rev. D 96, 122002*
- 2017-10-26: Search for magnetic inelastic dark matter with XENON100, arXiv:1704.05804 EB page
  cite as: *XENON100, JCAP 10 (2017) 039.*
- 2017-7-25: Search for WIMP Inelastic Scattering Off Xenon Nuclei With XENON100, 1705.05830, EB page
  cite as: *E. Aprile et al. (XENON Collaboration), Phys. Rev. D 96, 022008 (2017).*
- 2017-8-31: Effective field theory search for high-energy nuclear recoils using the XENON100 dark matter detector, 1705.02614,
  cite as: *E. Aprile et al. (XENON),Phys.Rev. D 96 042004 (2017).*
- 2017-6-2: Online Rn-222 removal by cryogenic distillation in the XENON100 experiment, 1702.06942, EB page
  cite as: *E. Aprile et al. (XENON), Eur. Phys. J. C 77, 358 (2017).*
- 2017-4-11: Results from a calibration of XENON100 using a source of dissolved radon-220, arXiv:1611.03585, EB page
  cite as: *E. Aprile et al. (XENON), Phys. Rev. D 95, 072008 (2017).*
- 2017-3-06: Search for Electronic Recoil Event Rate Modulation with 4 Years of XENON100 Data, arXiv:1701.00769, EB page
  cite as: *E. Aprile et al. (XENON), Phys. Rev. Lett. 118, 101101 (2017).*
- 2017-2-13: Search for Double Electron Capture of Xe-124 with XENON100, arXiv:1609.03354, EB Page
  cite as: *E. Aprile et al. (XENON), Phys. Rev. C 95, 024605 (2017).*

DM lab @ Nikhef



- XAMS
  - ➡Kiefer (MSc): radon in xenon
  - ➡Katherine (MSc): neutrons in xenon
- Analytics
  - ➡Ester (BSc): radon in xenon gas
- Modulation
  - ➡Joran, Jasper (MSc): does it or not?

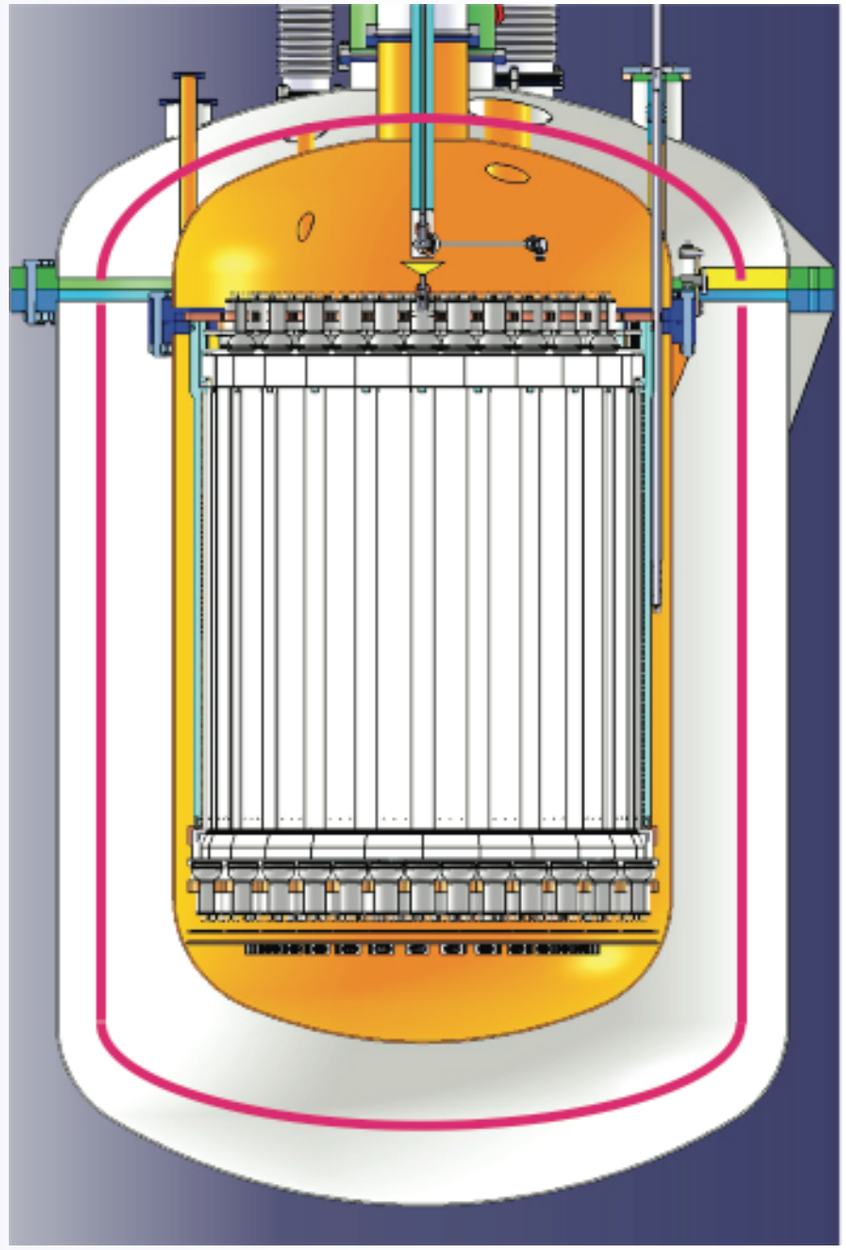




Outlook – from 2014 jamboree talk

- XENON1T moved forward in 2014
- XENON1T ready & taking data in 2015
- XENON1T discovery in 2017?
- XENONnT starting in 2018

XENON1T➔XENONnT

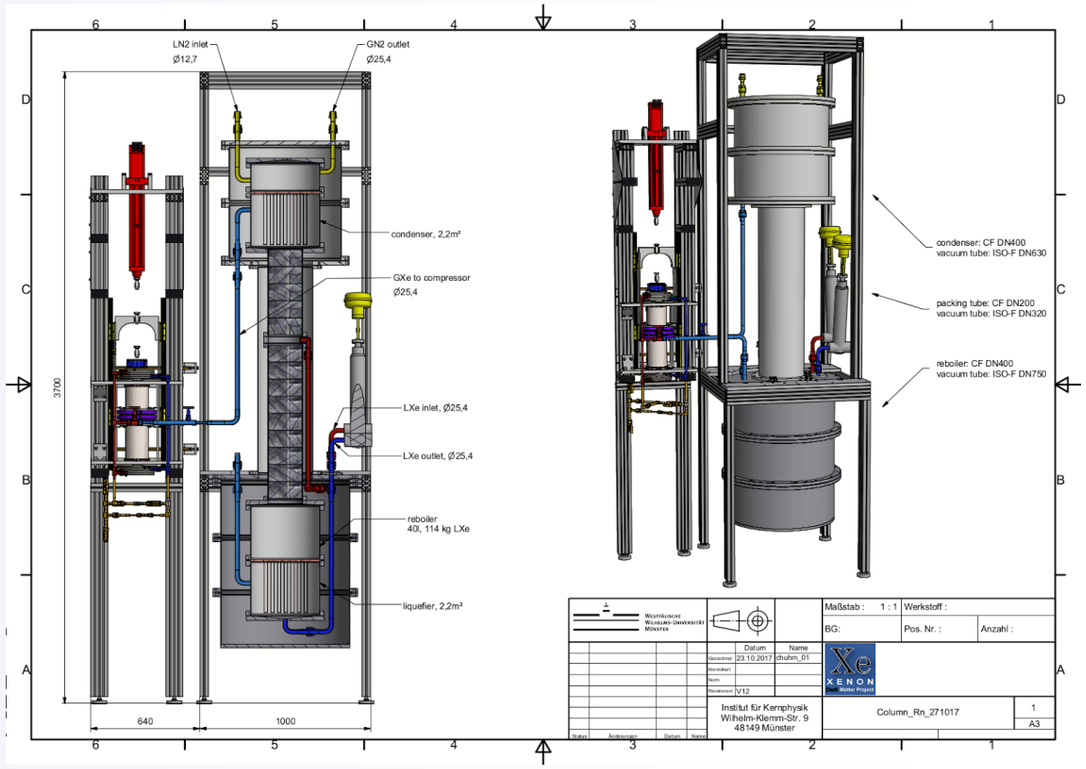


What is XENONnT?

- Final upgrade for XENON collaboration

  ➡From 3000kg LXe to 8000kg Lxe

  ➡From 1400kg target to 3000kg target



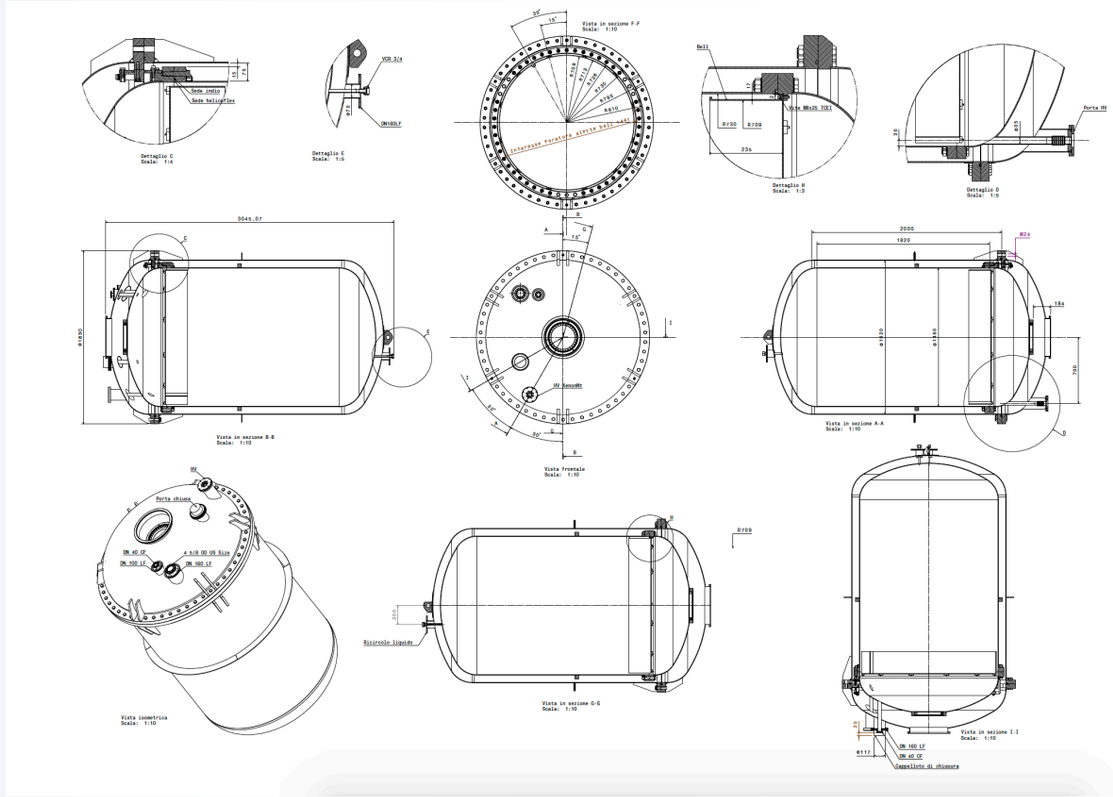
- New features to beat the backgrounds

  ➡^{85}Kr has been defeated

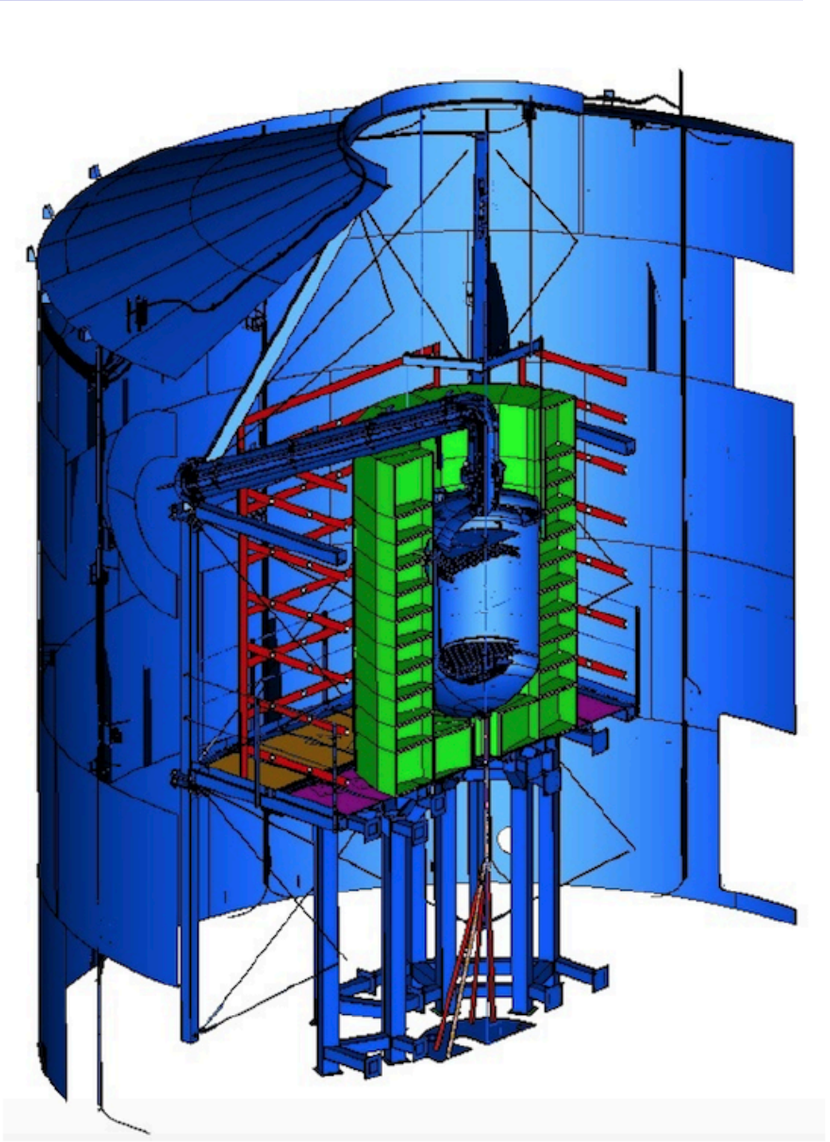
  ➡^{222}Rn now our enemy: Munster colleagues develop distillation techniques

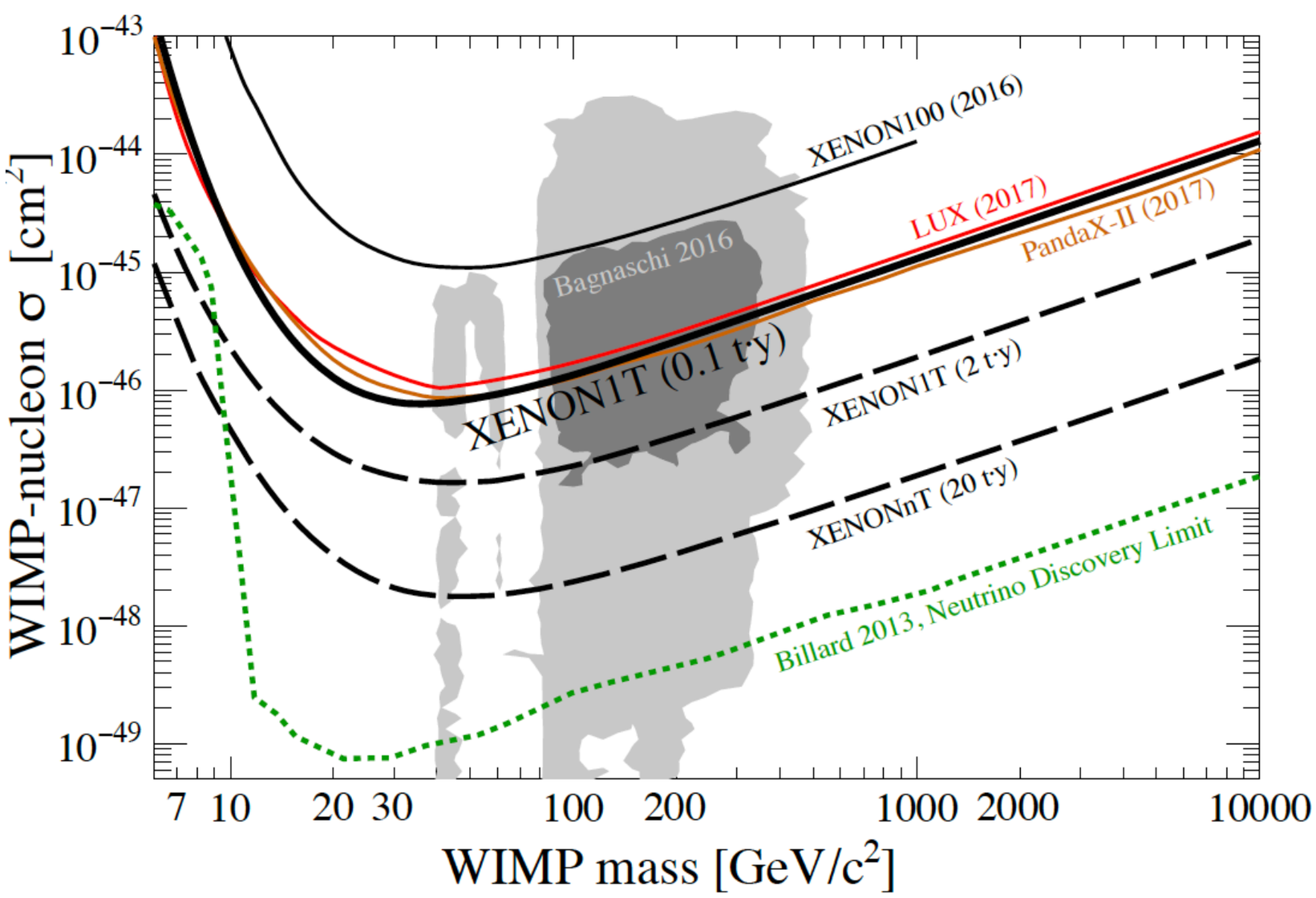
  ➡Neutrons. Liquid scintillator veto proposed to surround the detector.

APC technical coordinator



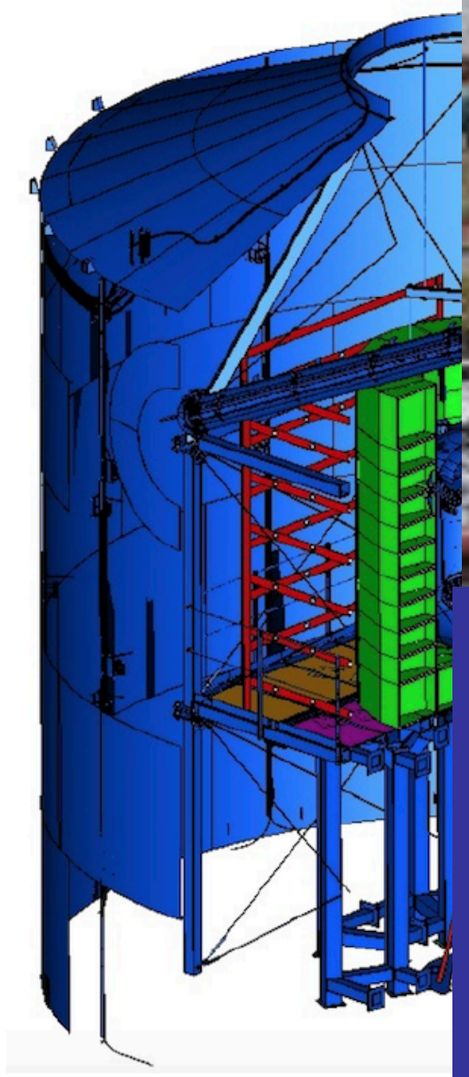
Goal is 10x higher sensitivity compared to 1T

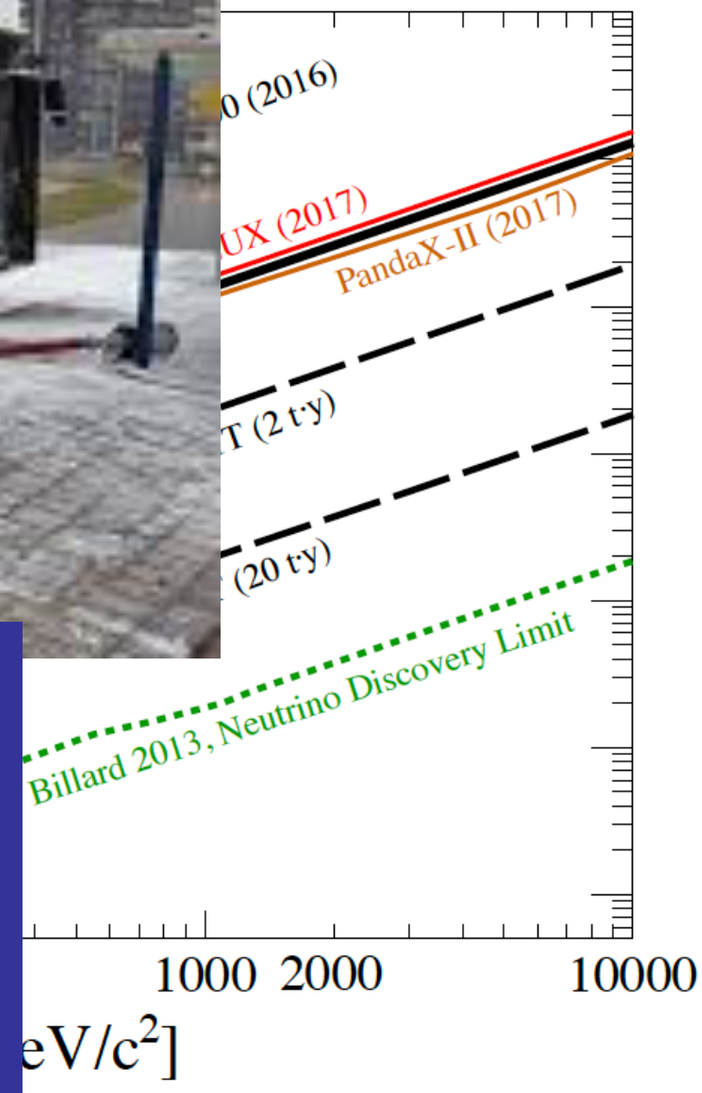




… and a discovery (if XENON1T doesn't)

Goal is 10x higher sensitivity compared to 1T





Connexxion: DM – neutrino physics

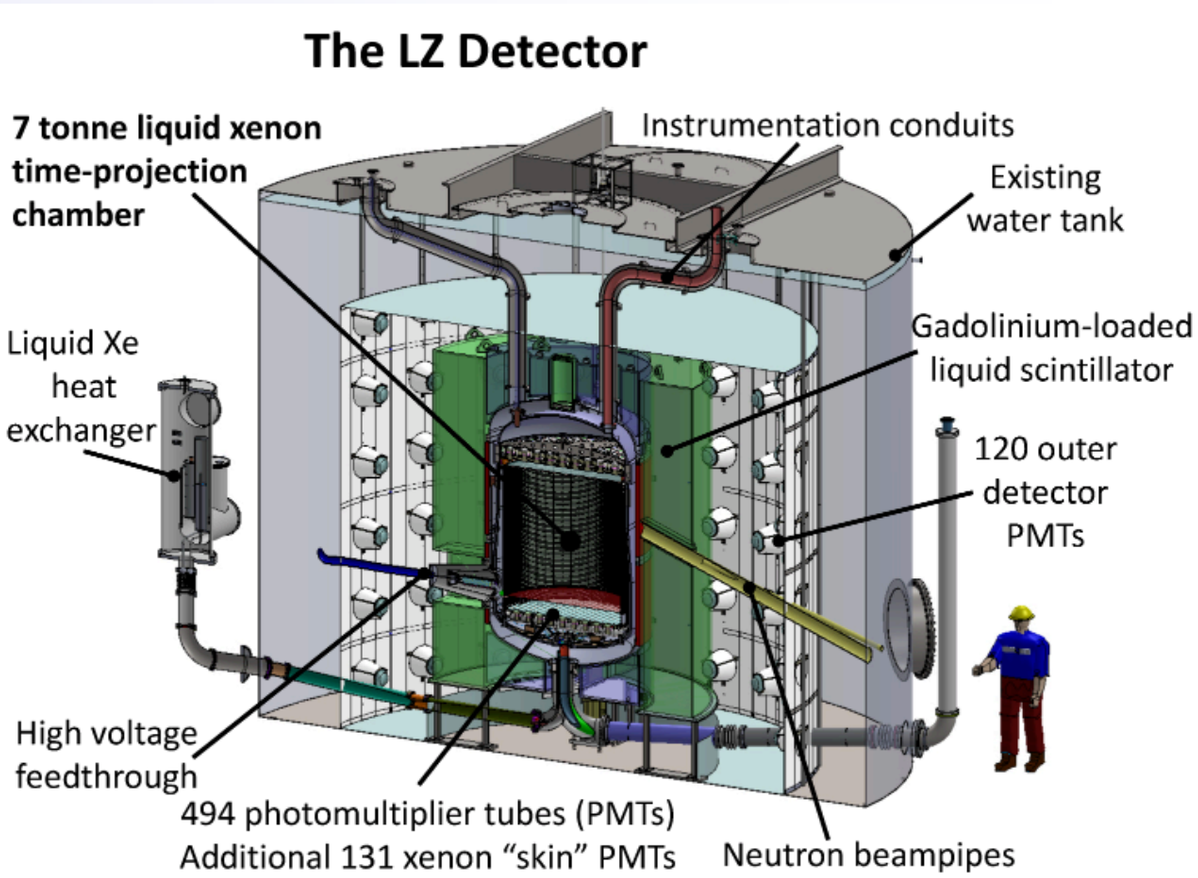
- Properties: neutrino-less double beta decay
- Astro: SN in Milky Way / LMC

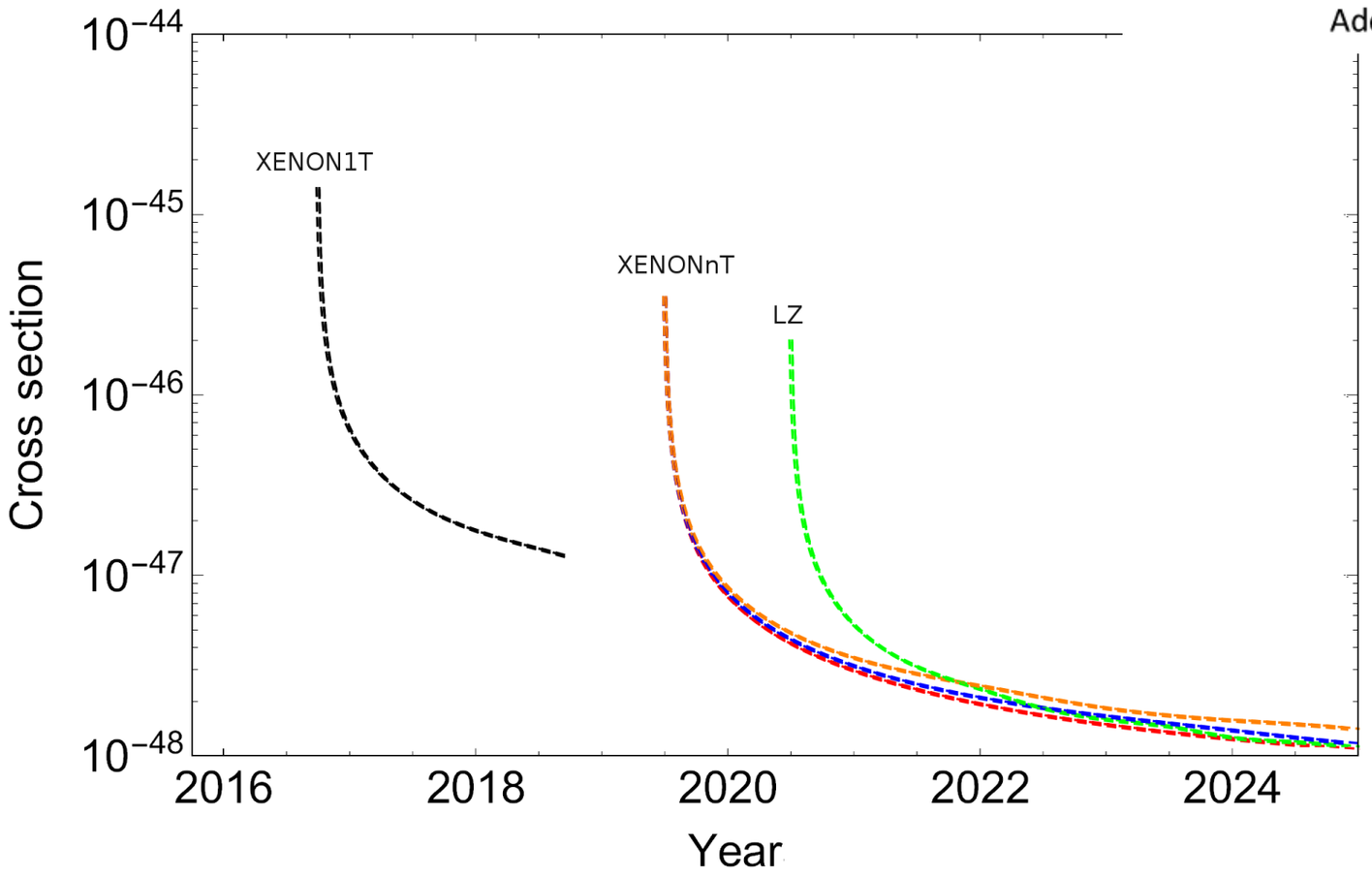
Connexxion: DM – ATLAS

- Making DM

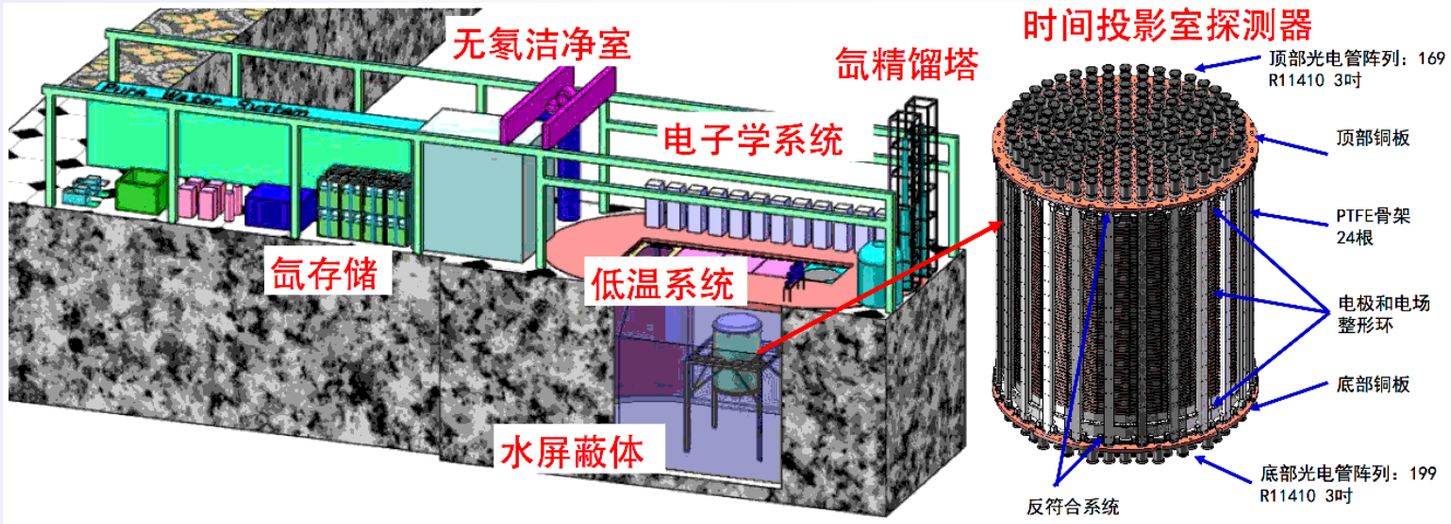
… and a discovery (if XENON1T doesn't)

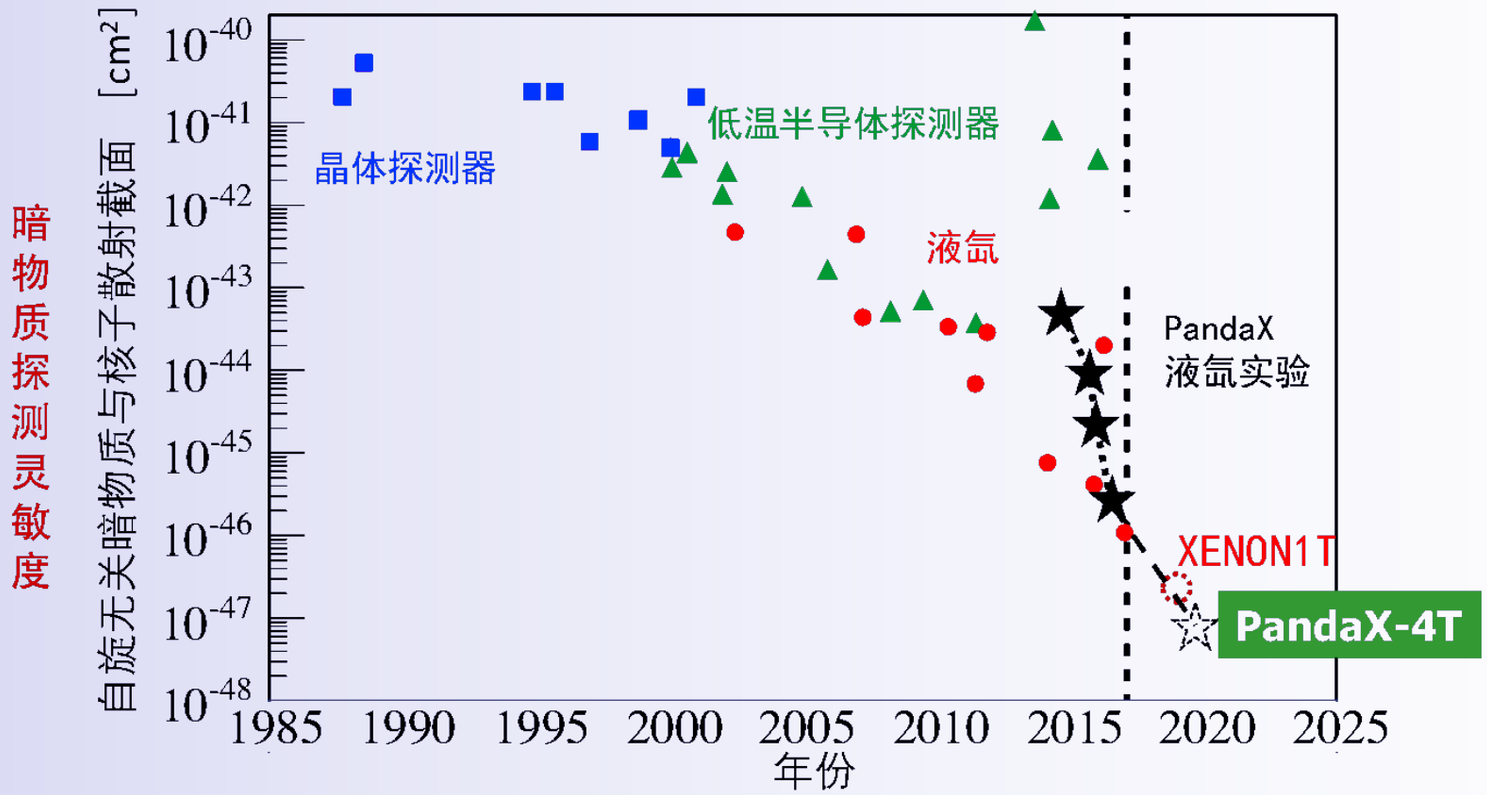
What about the USA?





What about China?





Translate

Turn off instant translation

Dutch | English | Spanish | Detect language

English | Chinese (Traditional) | Chinese (Simplified) | Translate

spin-independent dark matter nucleon cross section

50/5000

自旋无关的暗物质核子横截面

Zì xuán wúguān de ànwùzhí hézǐ héng jiémiàn

Suggest an edit

Summary

- Exciting time to still look for WIMPs
- XENON collaboration will make a quick transition from 1T->nT
- First Nikhef-DarkMatter-XENON-thesis-defence on January 12th by Andrea Tiseni.
- Maybe we already have discovered WIMPs. We will know mid-January.