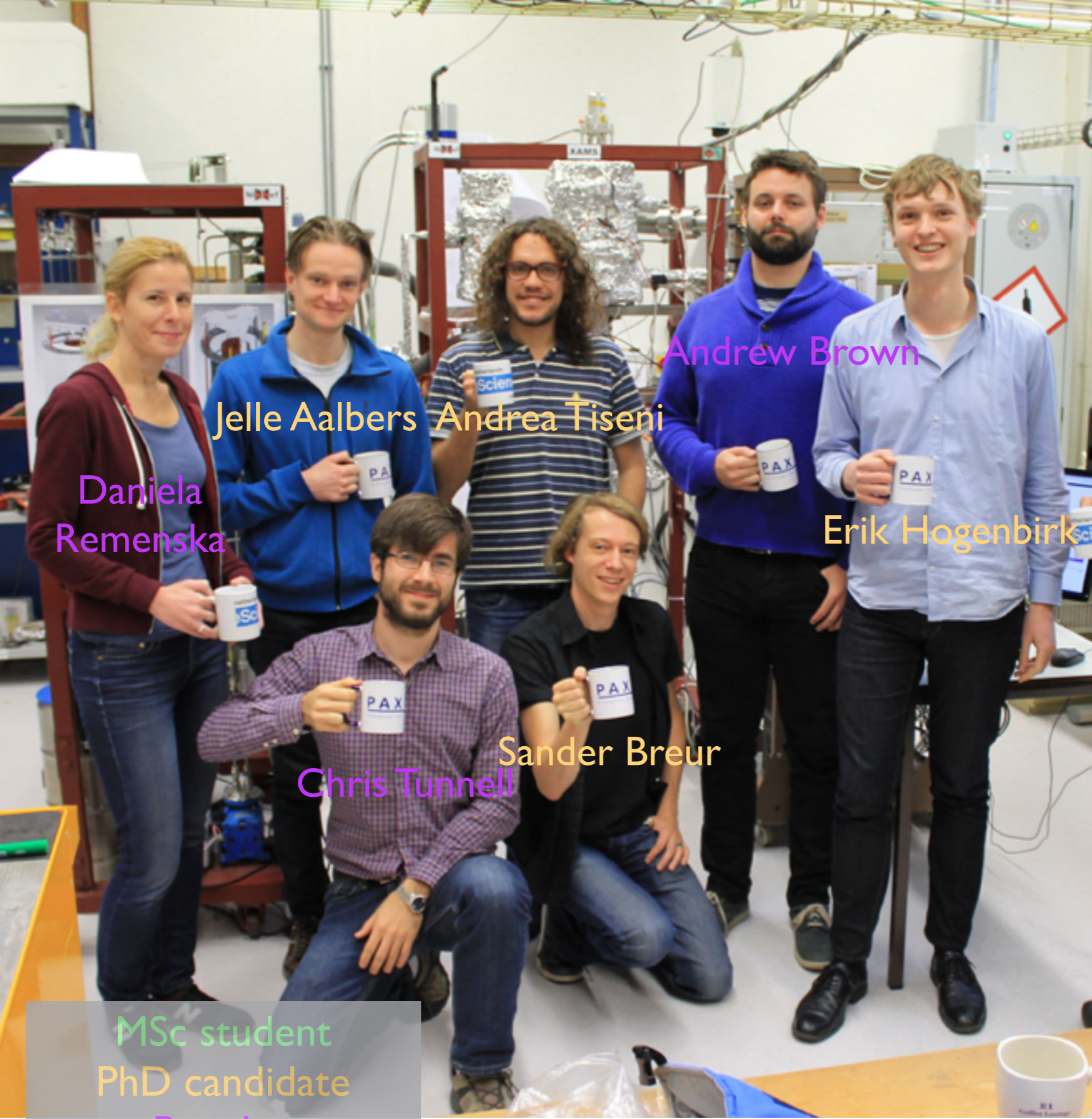




The Nikhef Dark Matter Group

Patrick Decowski
decowski@nikhef.nl

Nikhef Jamboree 2015, Amsterdam



Daniela Remenska

Jelle Aalbers

Andrea Tiseni

Andrew Brown

Erik Hogenbirk

Chris Tunnell

Sander Breur

MSc student
PhD candidate
Postdoc
Rest



Auke-Pieter Colijn



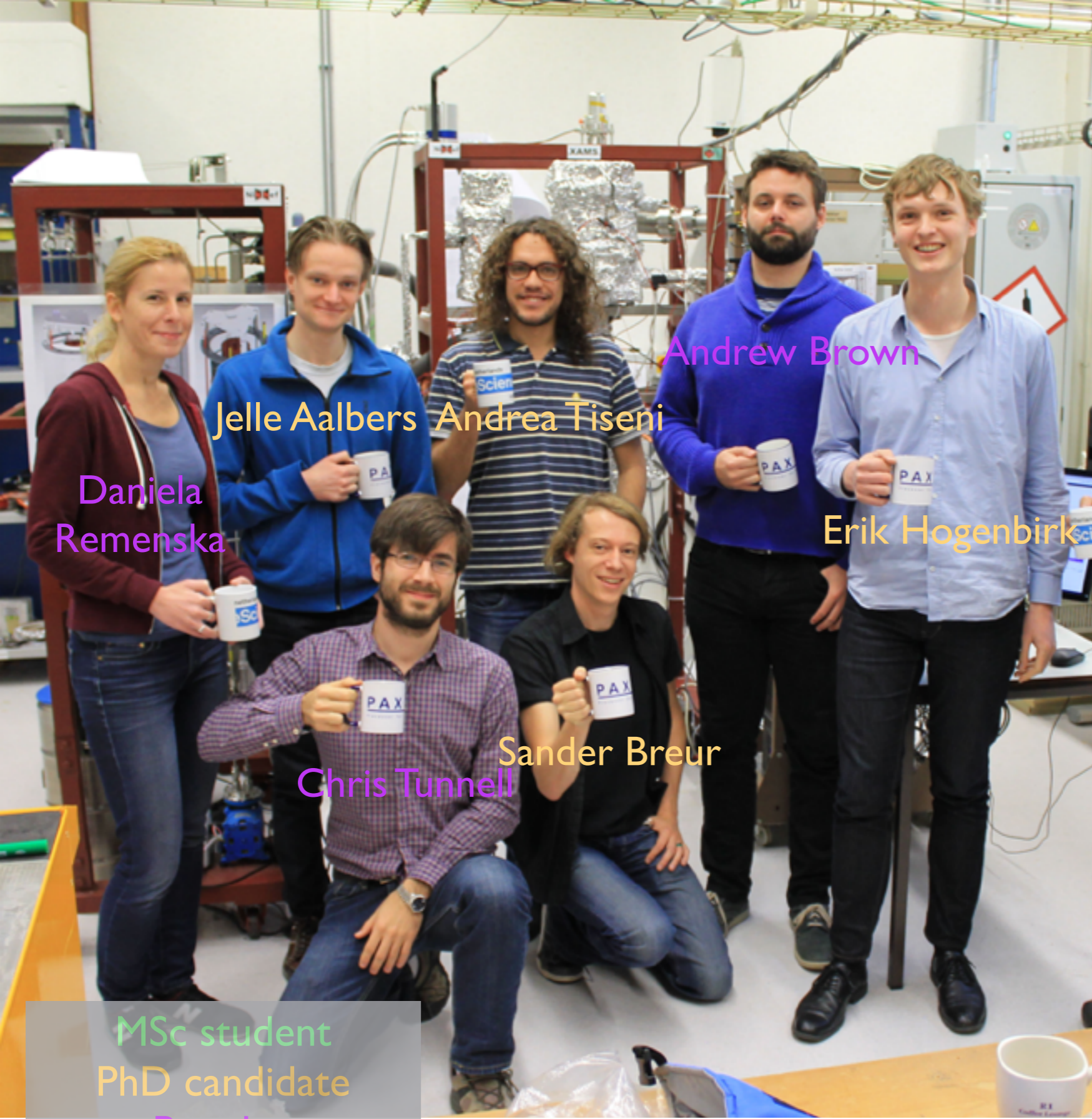
Patrick Decowski



Frank Linde



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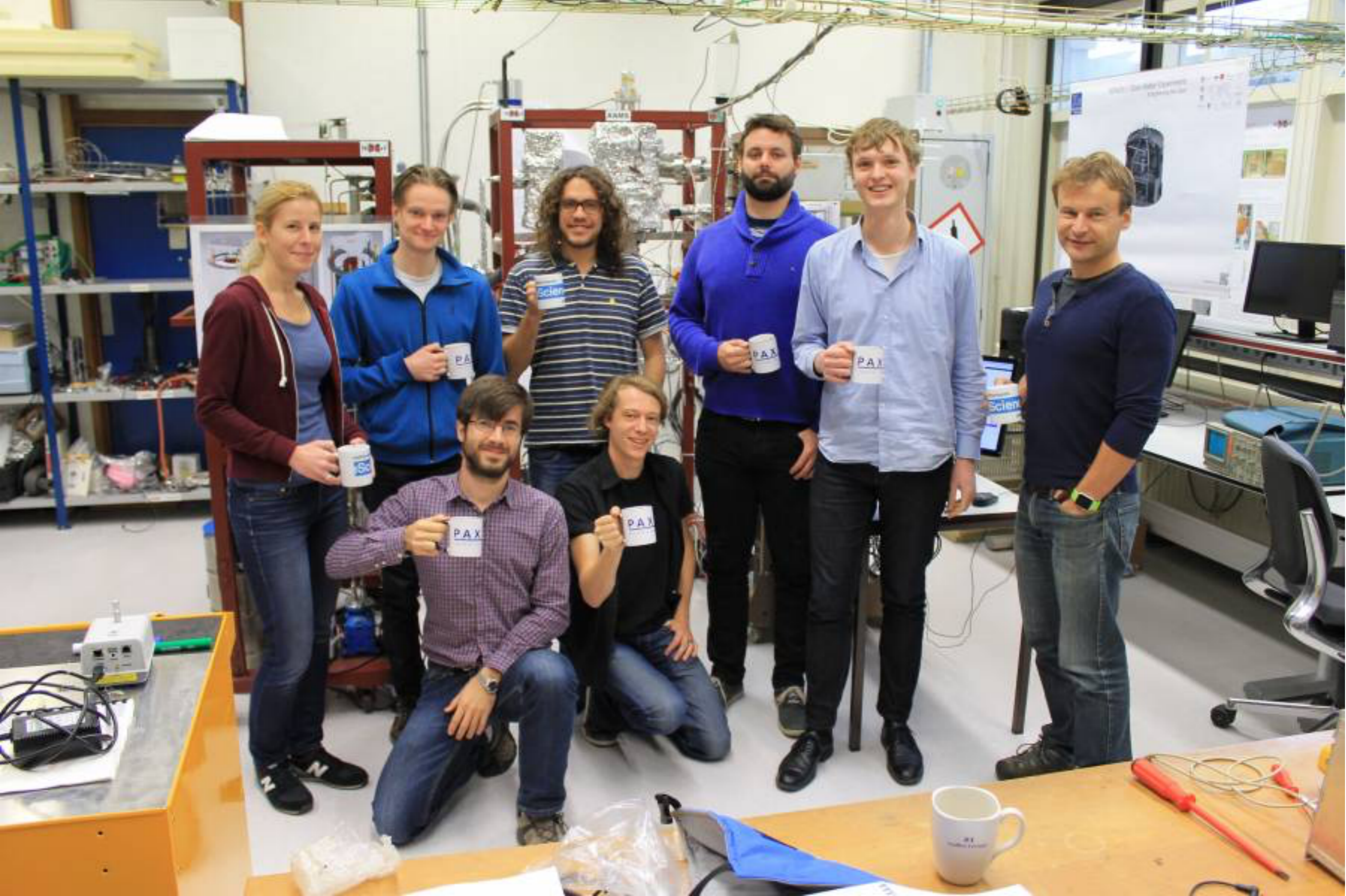
Left the group:

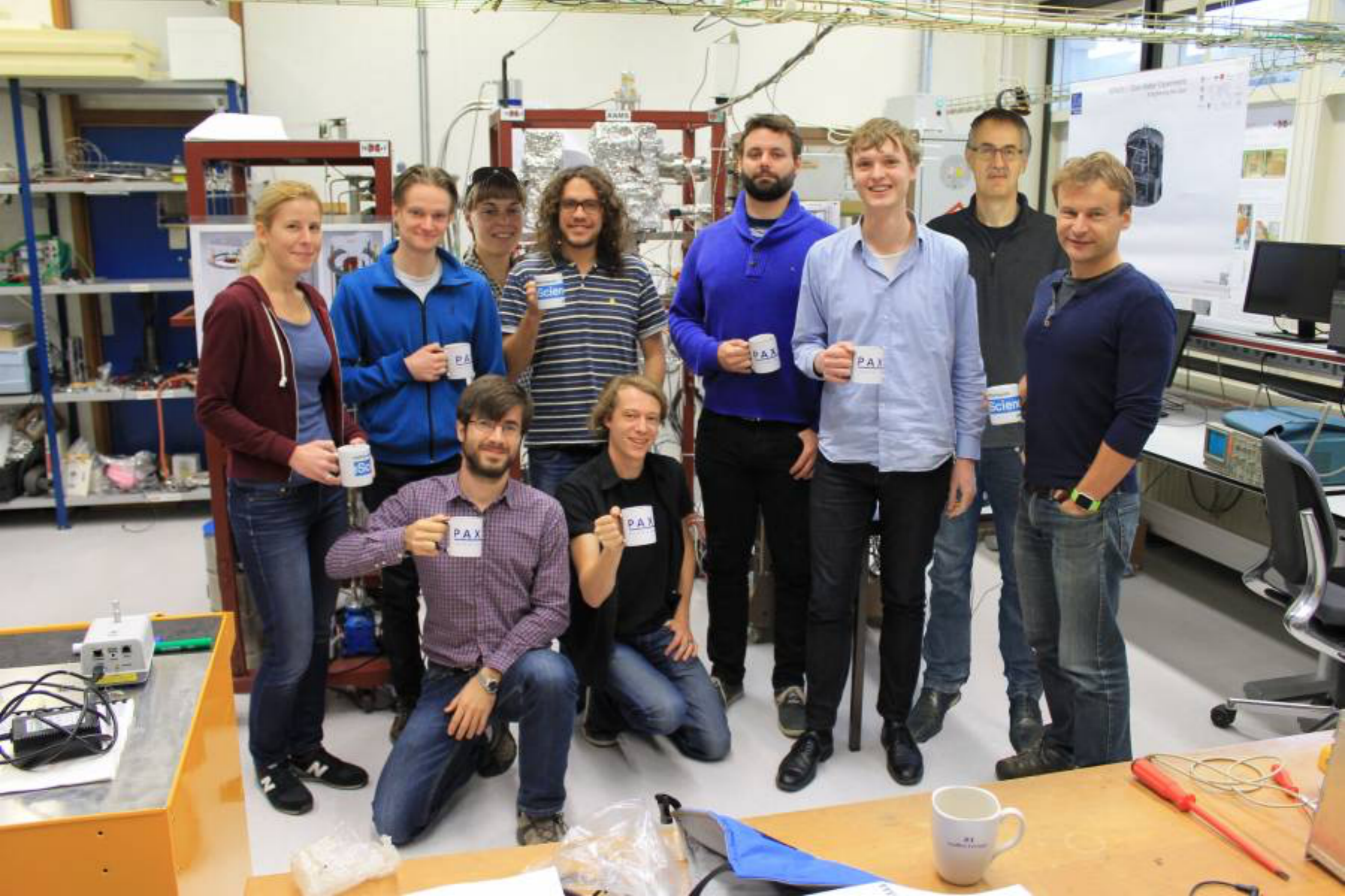


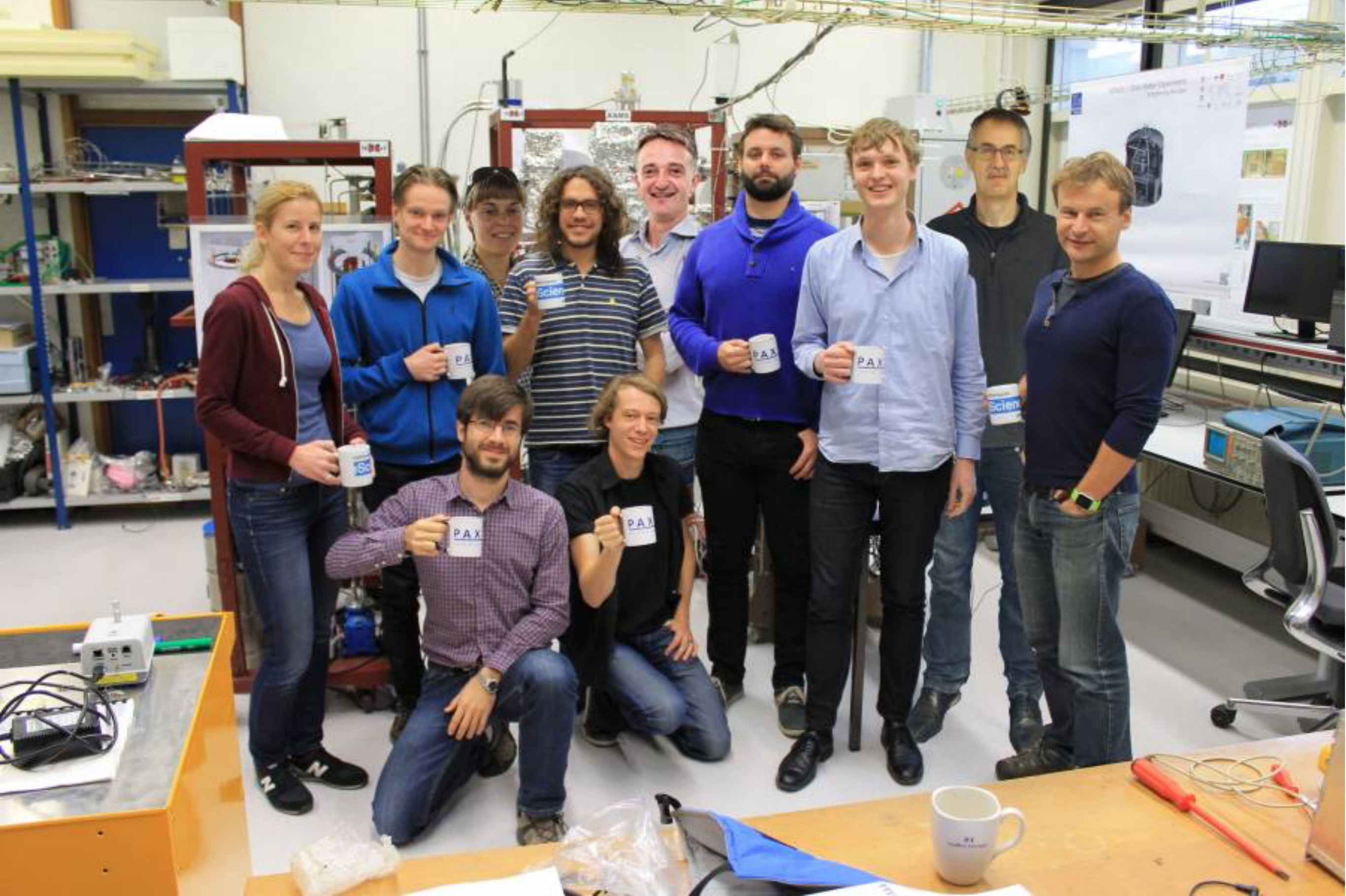
Maria Bader

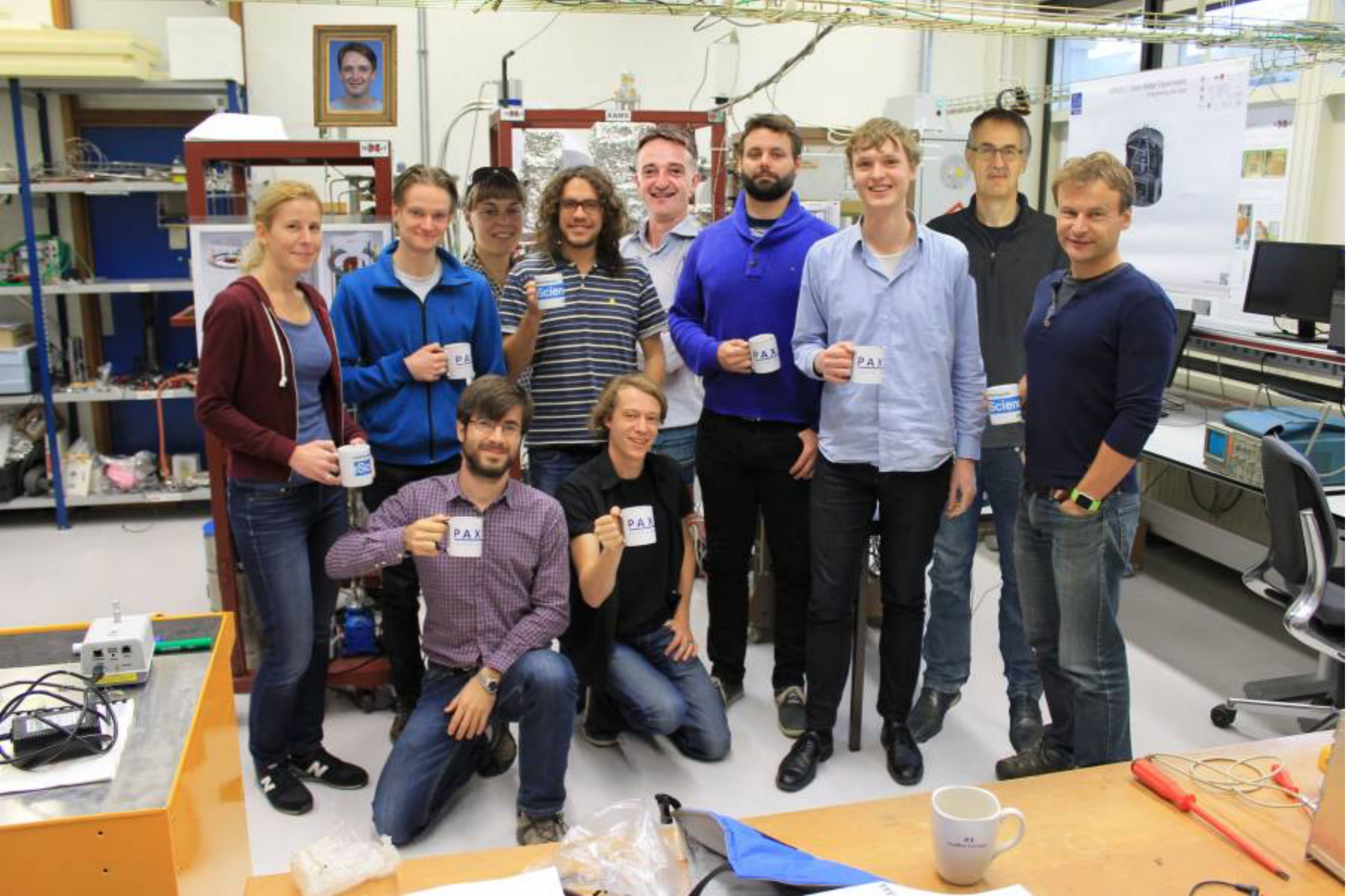


Bart Pelssers

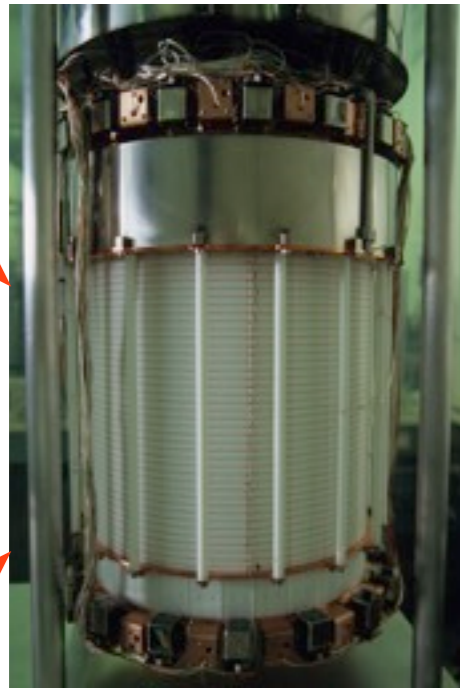








Our Activities



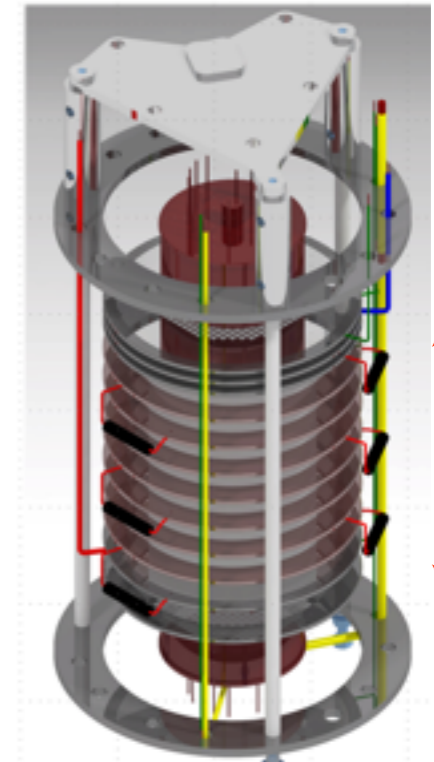
30cm

XENON100
(160kg Xe):
Analysis



100cm

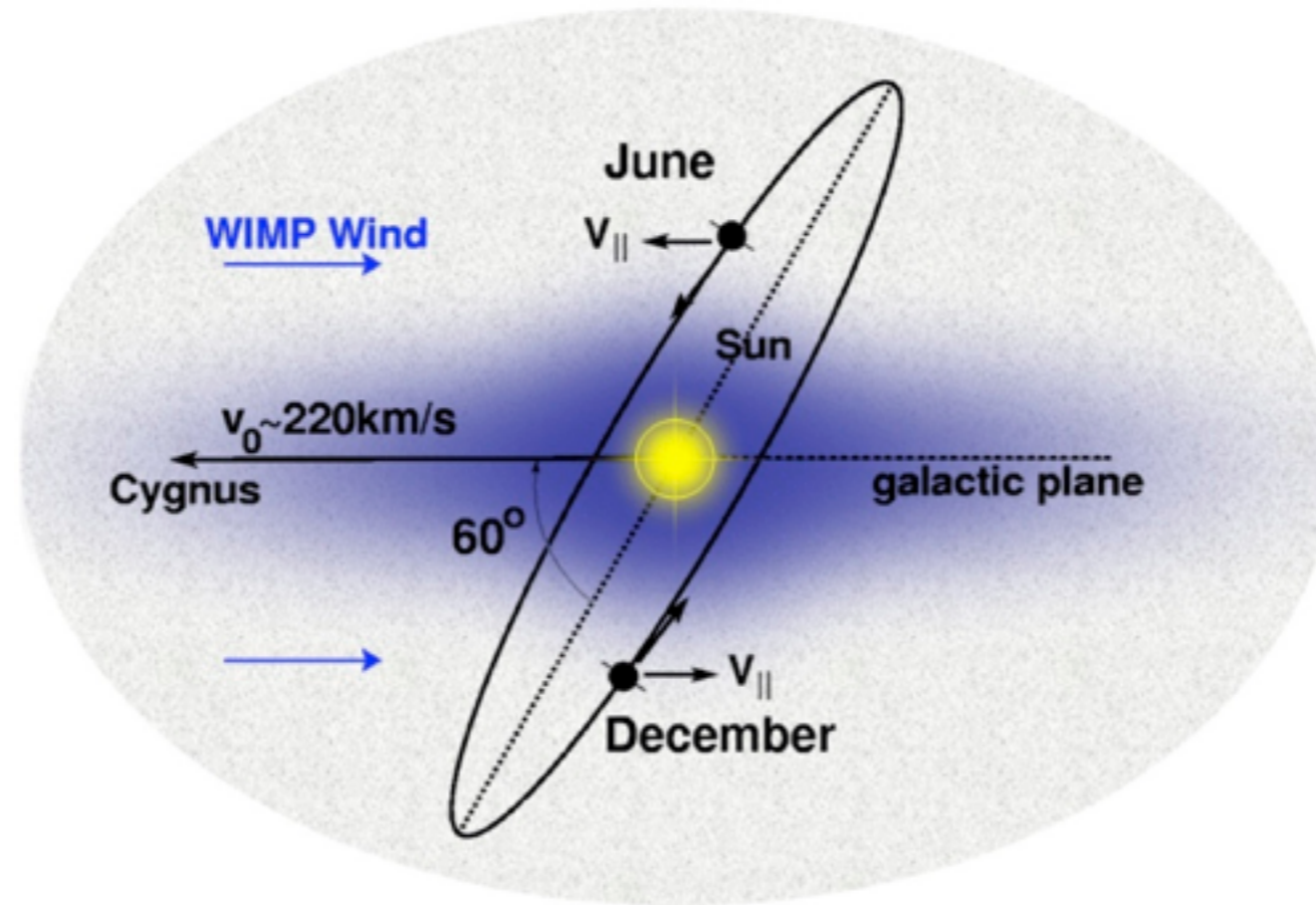
XENONIT
(3500kg Xe),
XENONnT
(7000kg Xe)
Cryostat & Support
DAQ / Trigger
Dataprocessor



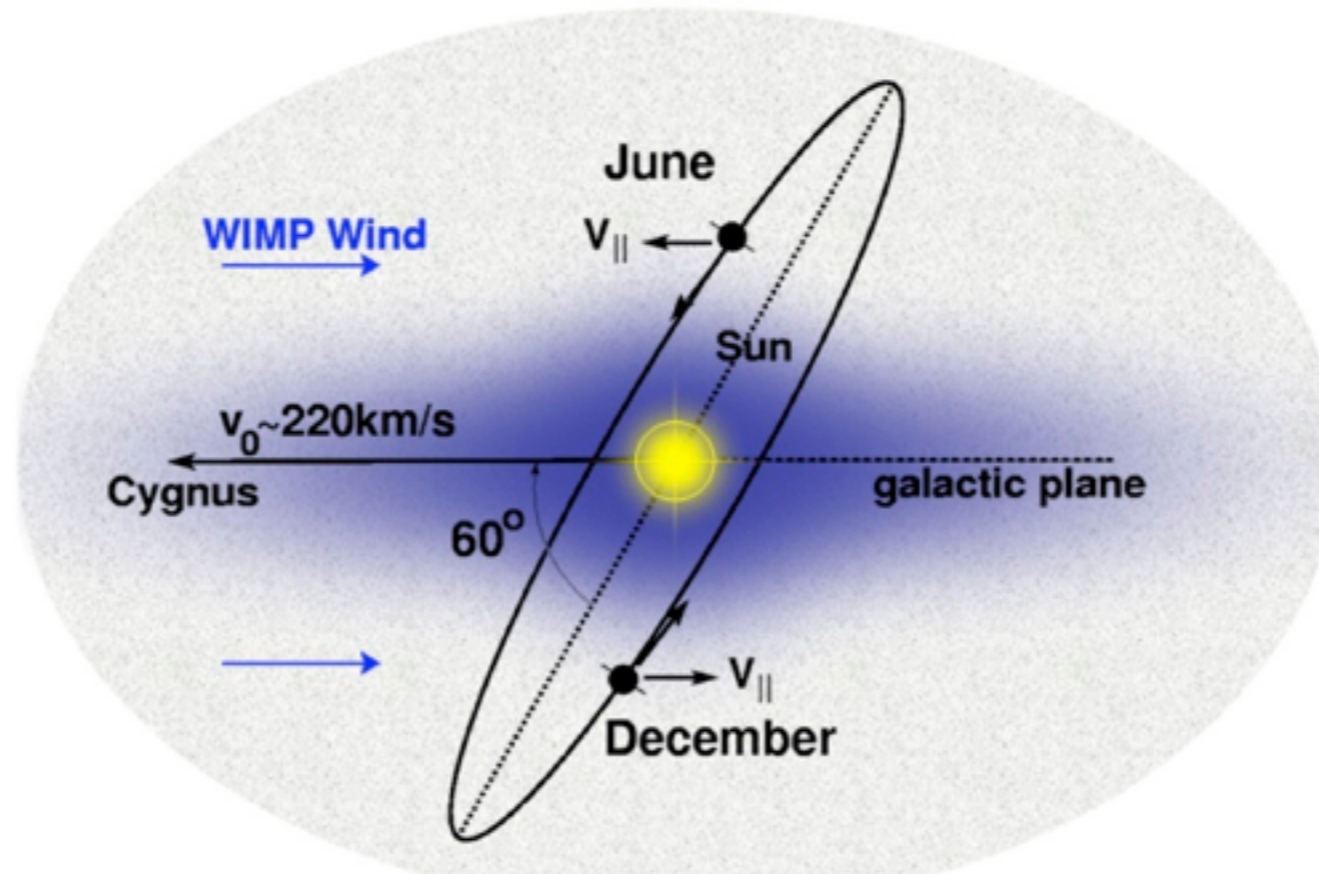
10cm

XAMS (0.5kg Xe): **ALL**

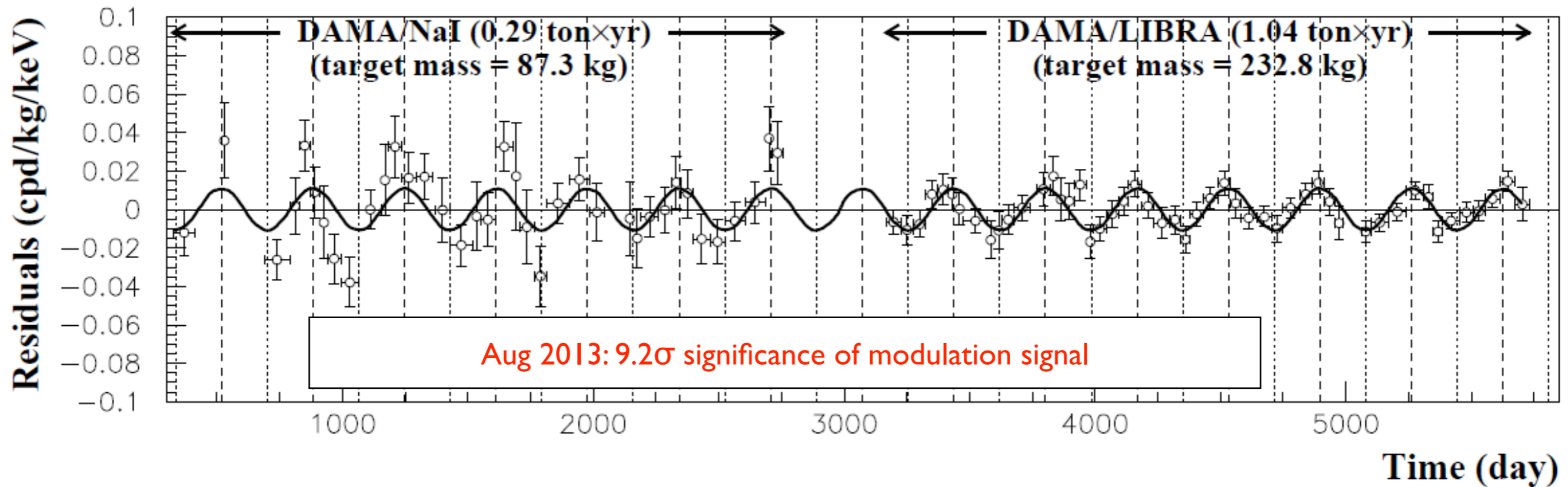
Use annual modulation: DM claim



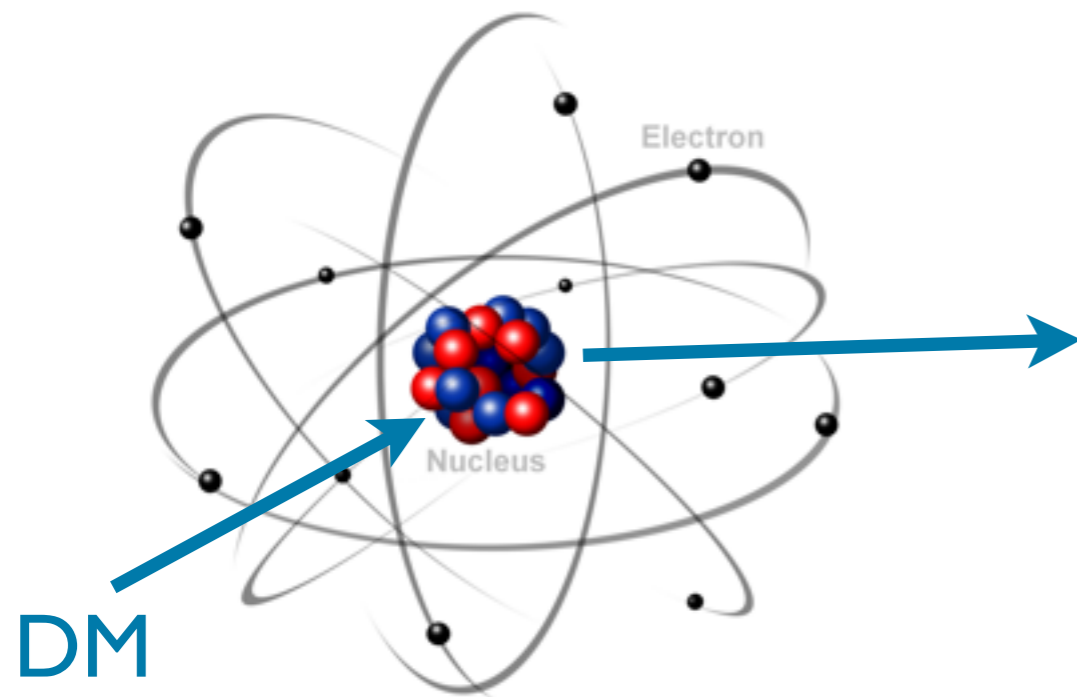
Use annual modulation: DM claim



Modulation present in 2-6 keV, absent above 6 keV

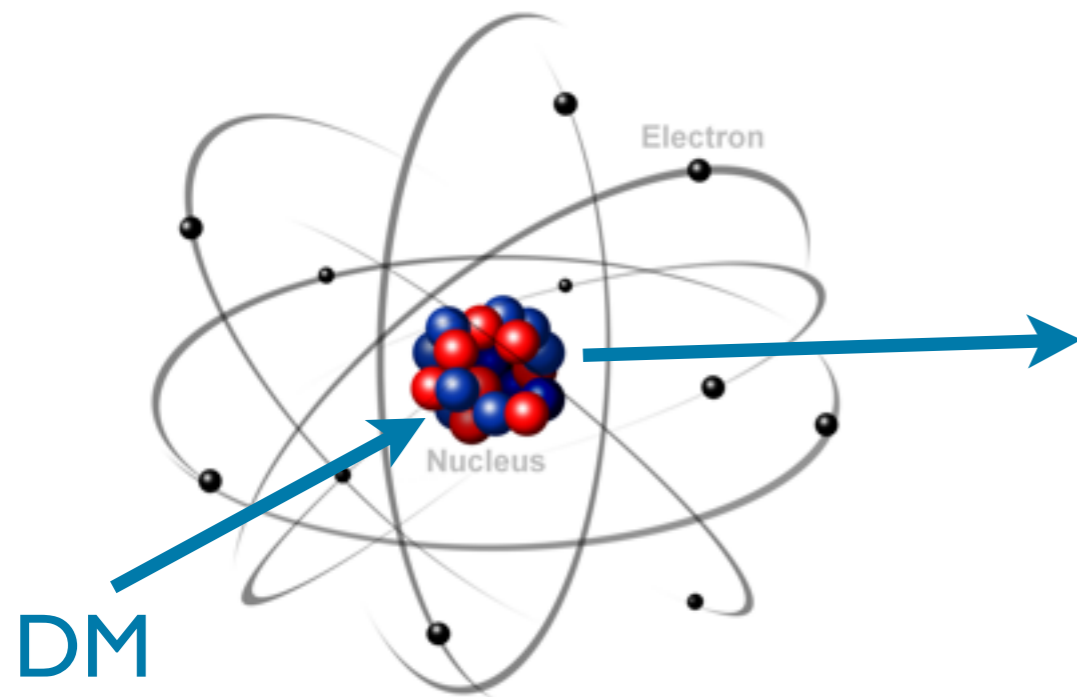


Identifying Electronic and Nuclear Recoils

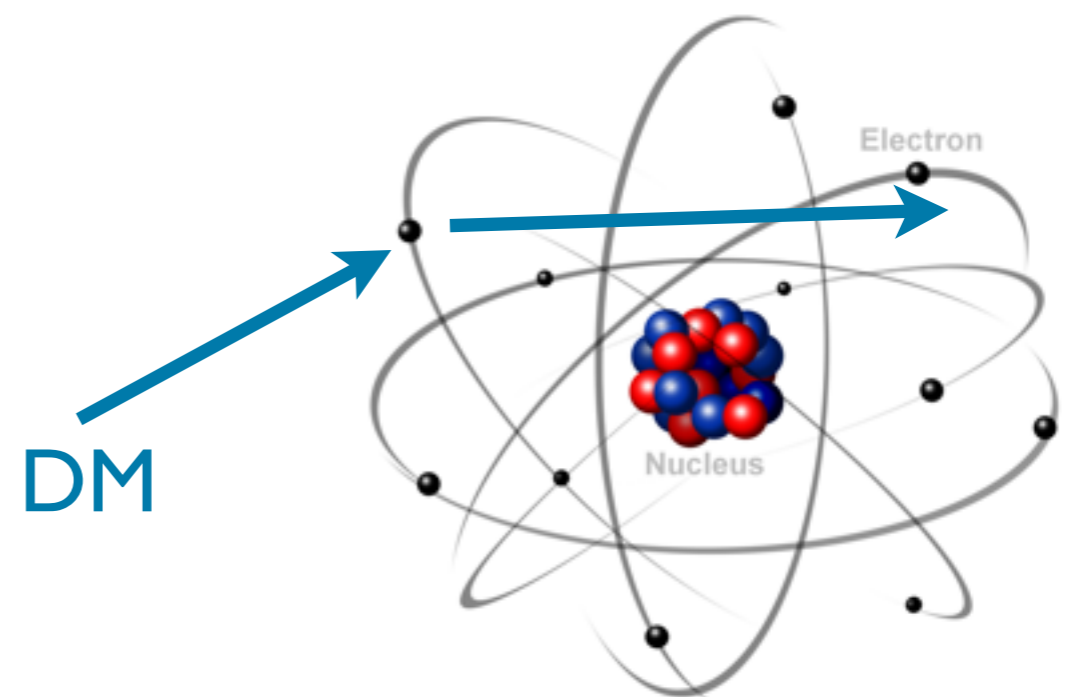


Nuclear Recoils

Identifying Electronic and Nuclear Recoils

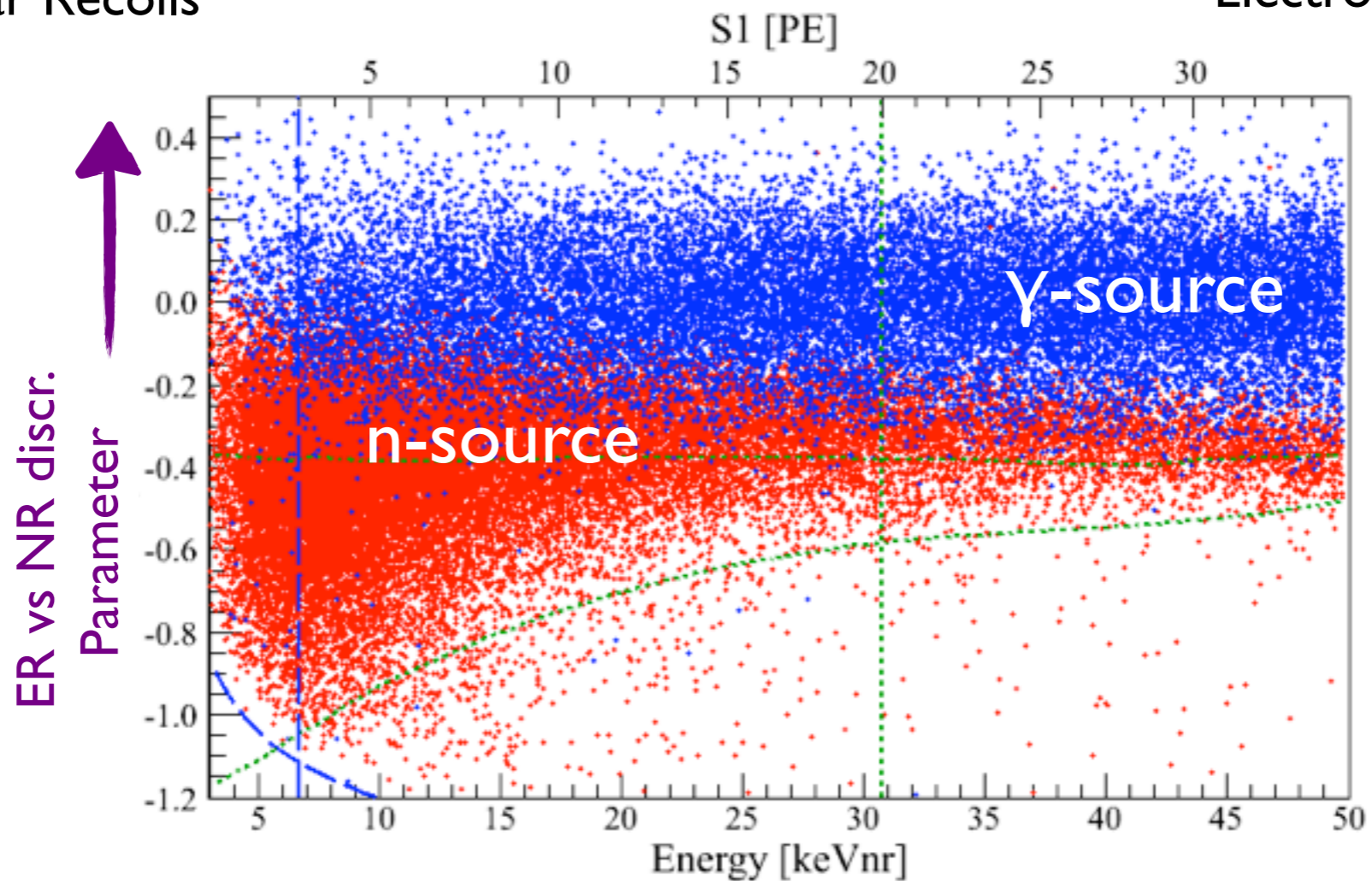
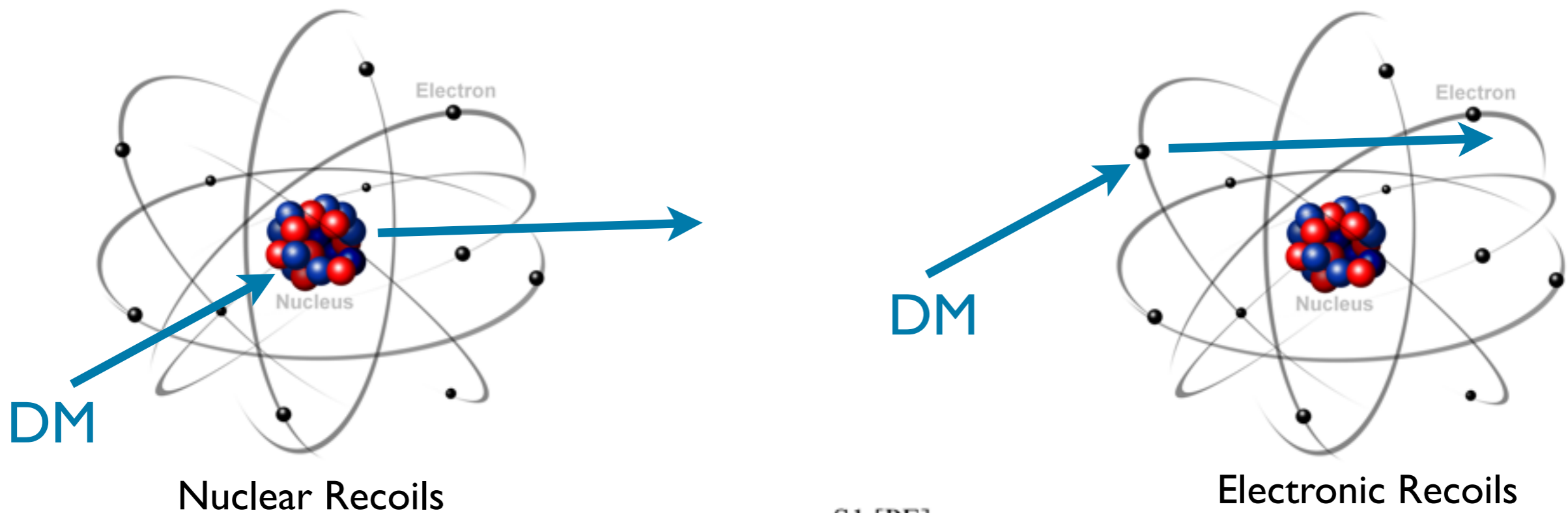


Nuclear Recoils

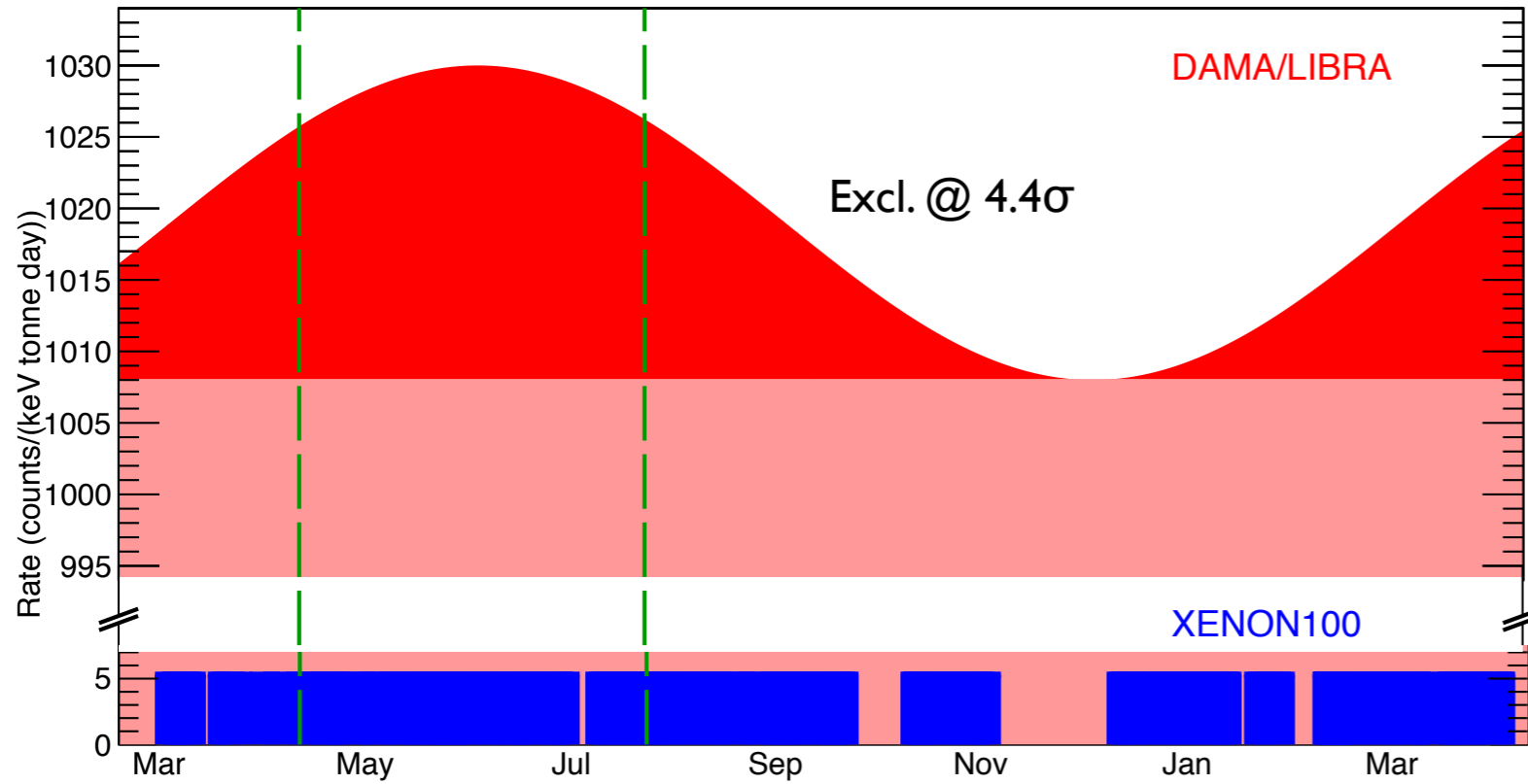


Electronic Recoils

Identifying Electronic and Nuclear Recoils



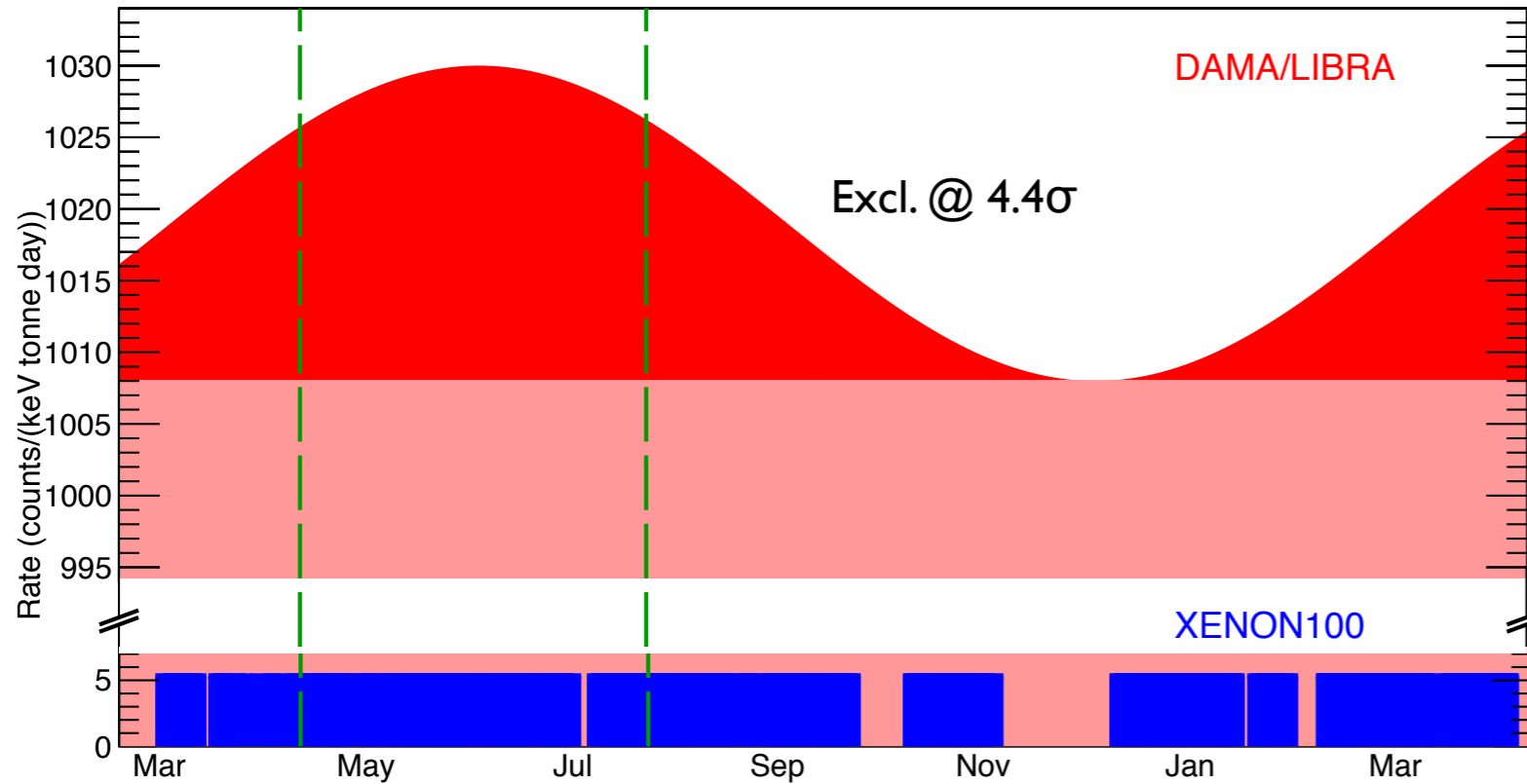
DM-electron scattering limits



“DC Analysis”:
Xe vs NaI

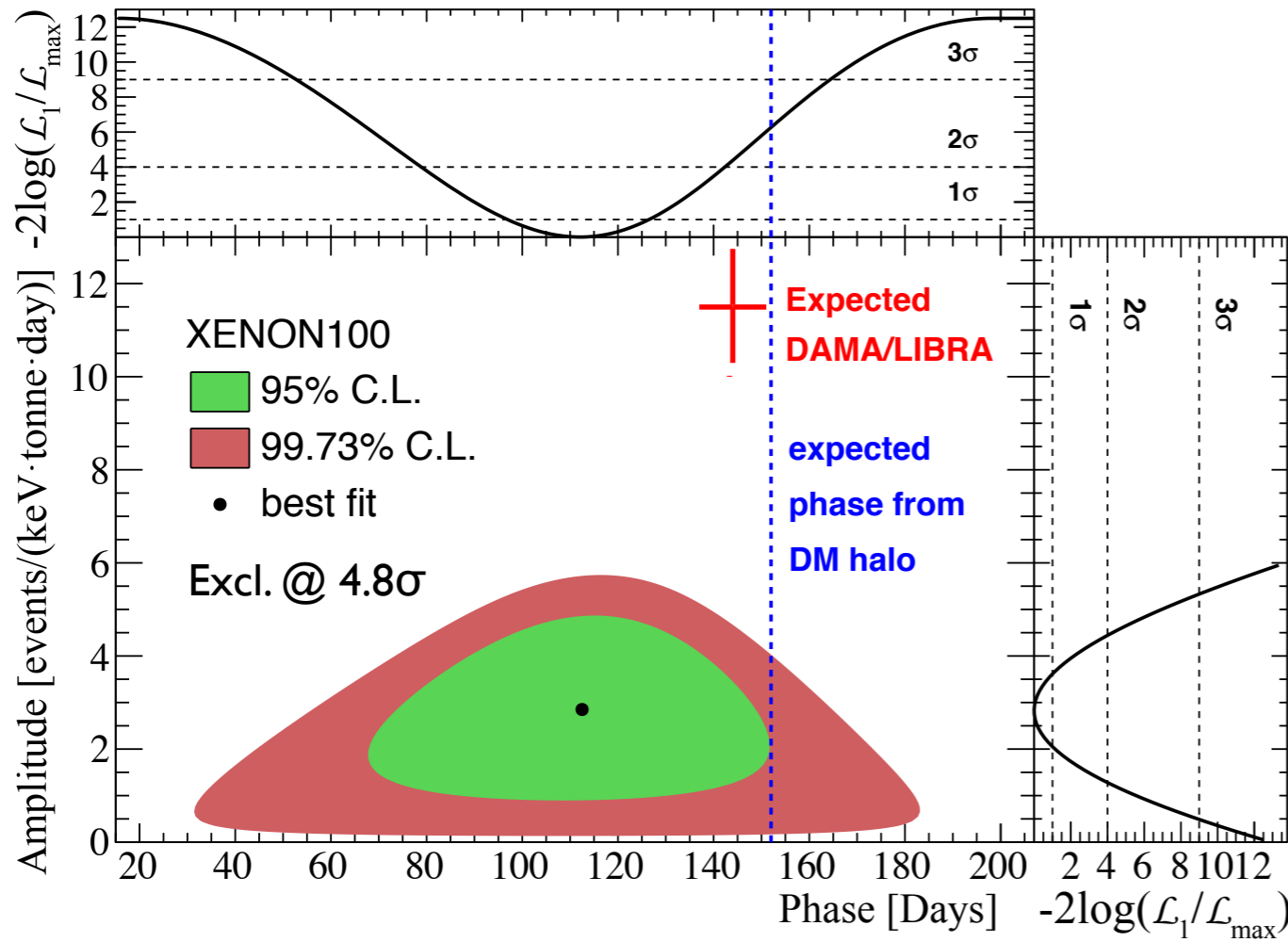
XENON100 Coll, *Science* 2015 vol. 349 no. 6250, 851,
arXiv:1507.07747

DM-electron scattering limits



“DC Analysis”:
Xe vs NaI

XENON100 Coll, *Science* 2015 vol. 349 no. 6250, 851, arXiv:1507.07747

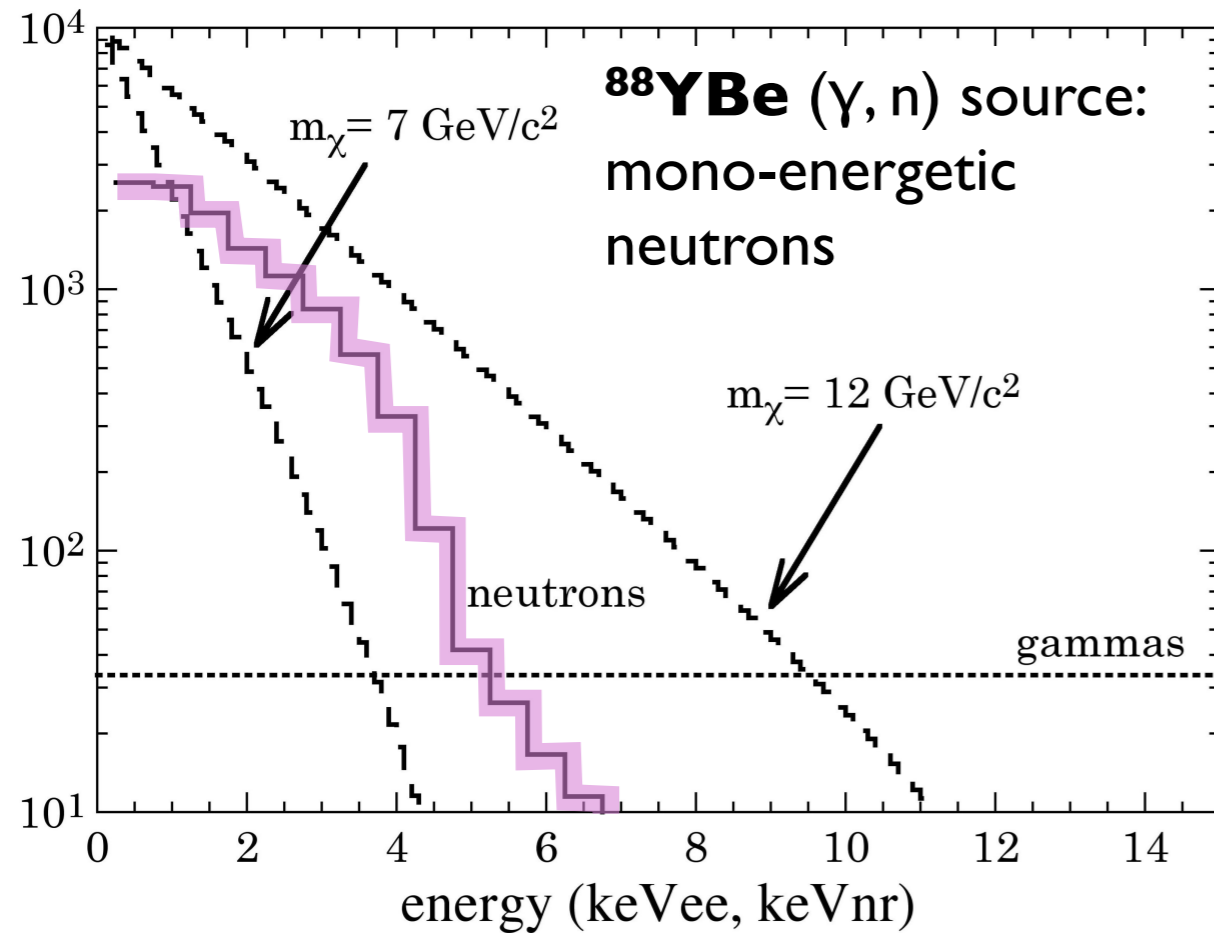


“AC Analysis”

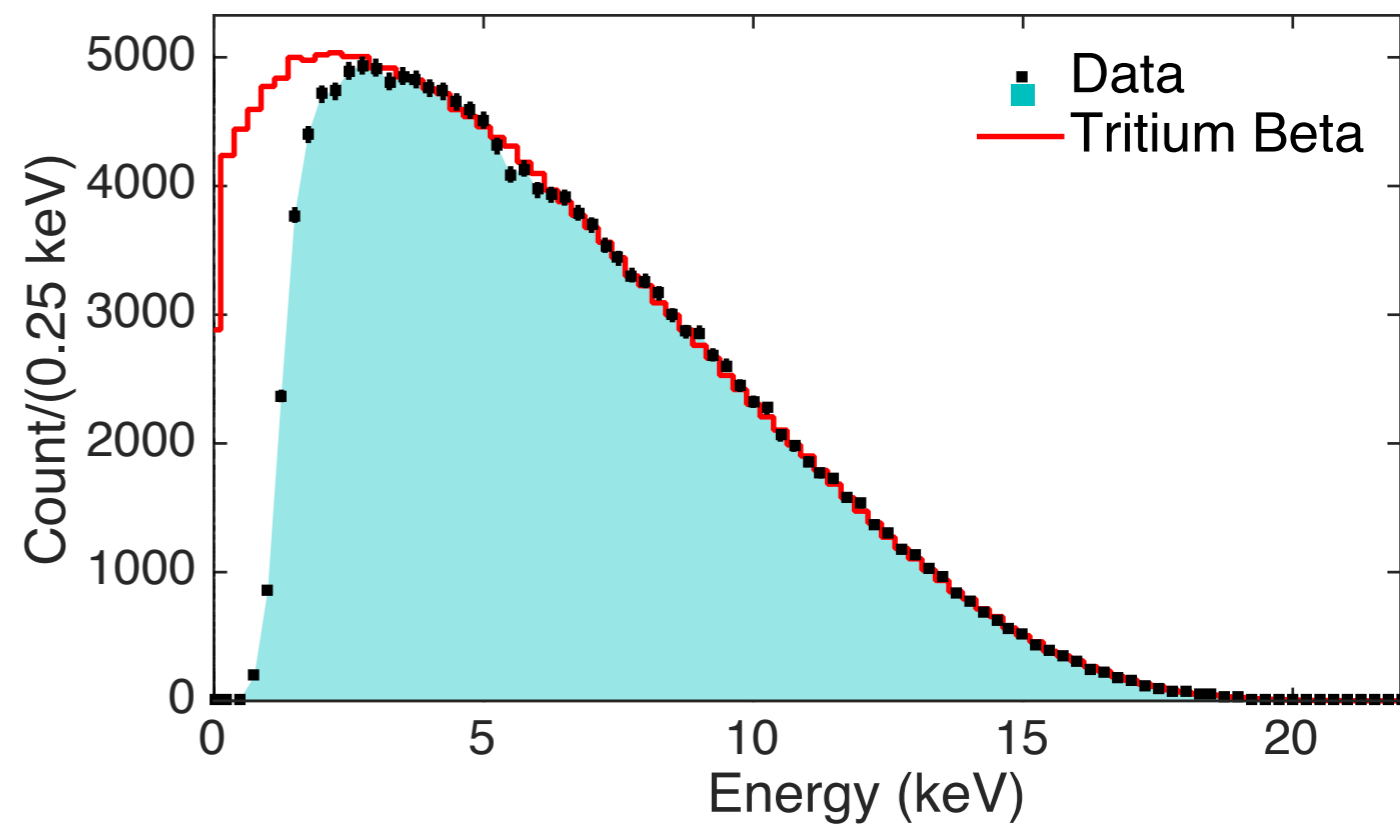
XENON100 Coll, *Phys. Rev. Lett.* 115, 091302 (2015), arXiv:1507.07748

Detailed Calibration program

J. Collar, arXiv: 1303.2686



LUX Coll, arXiv: 1512.03133



- Use XENON100 to test many different calibrations and technologies
 - Neutron calibration through ^{88}YBe - study low mass WIMPs
 - Electronic recoil calibration
 - $^{83\text{m}}\text{Kr}$
 - Tritiated methane: CH_3T
 - Radon spike tests to do cryogenic distillation of radon

Ongoing Analyses

- XENON100:
 - Low-mass WIMP analysis (Andrea, Chris)
 - Response to very low energy nuclear recoils (Andrew)
 - Update of “vanilla” WIMP analysis (Andrew)
- XENON1T:
 - Data Acquisition System (Chris)
 - Data processing software (Chris, Jelle)
 - Event classification, statistics (Jelle)
 - Radon background analysis (Sander)
 - Gain Calibration (Erik)
 - Prototype Amplifier (Sander)

Ongoing Analyses

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 - Prototype Amplifier (Sander)

**Chris Tunnell became
XENON1T analysis
co-coordinator**

XENONIT



Shown @
Jamboree'13

XENONIT



Shown @
Jamboree'13



Shown @
Jamboree'14

XENONIT



Shown @
Jamboree'13



Shown @
Jamboree'14



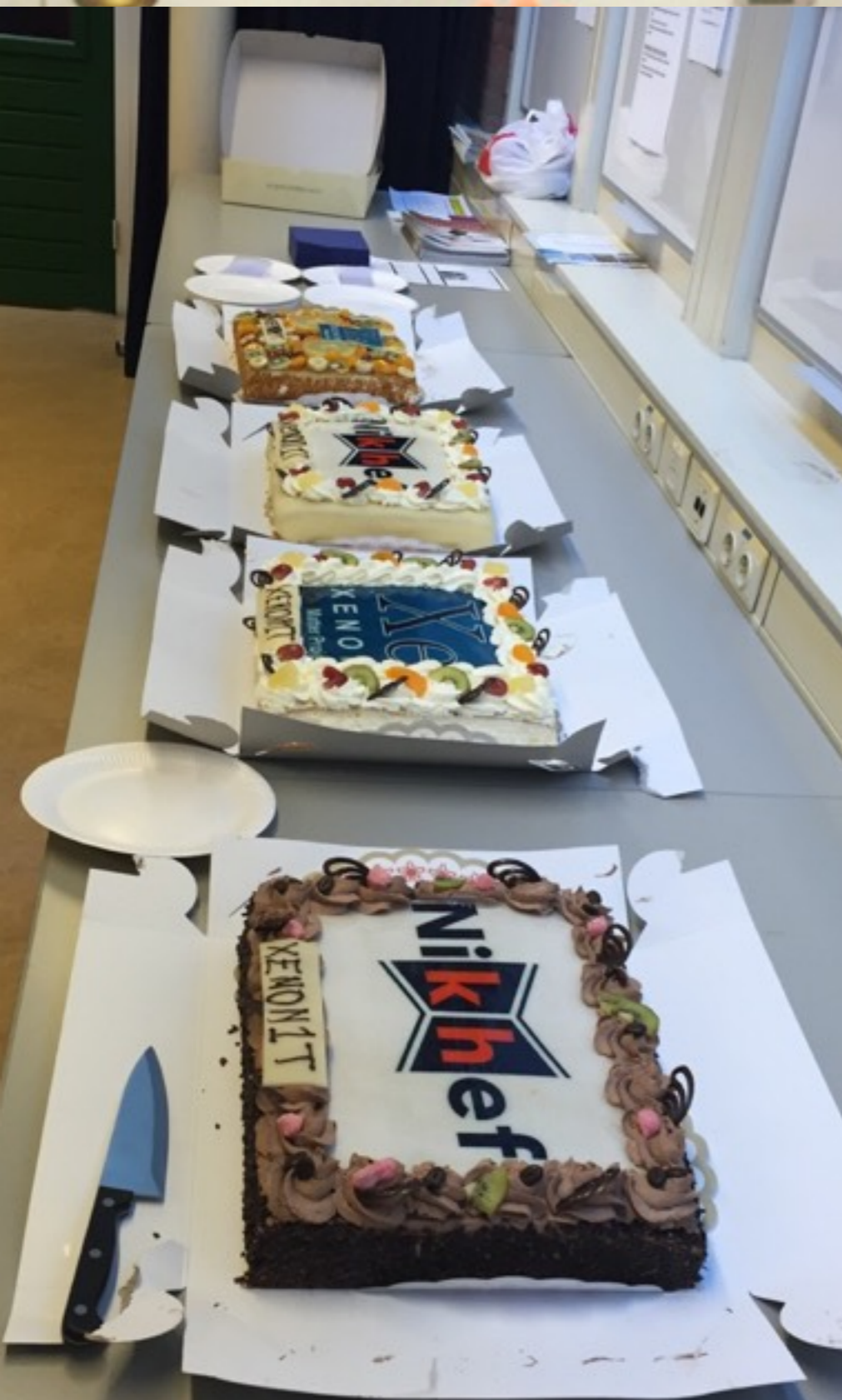
Inauguration on Nov 11, 2015

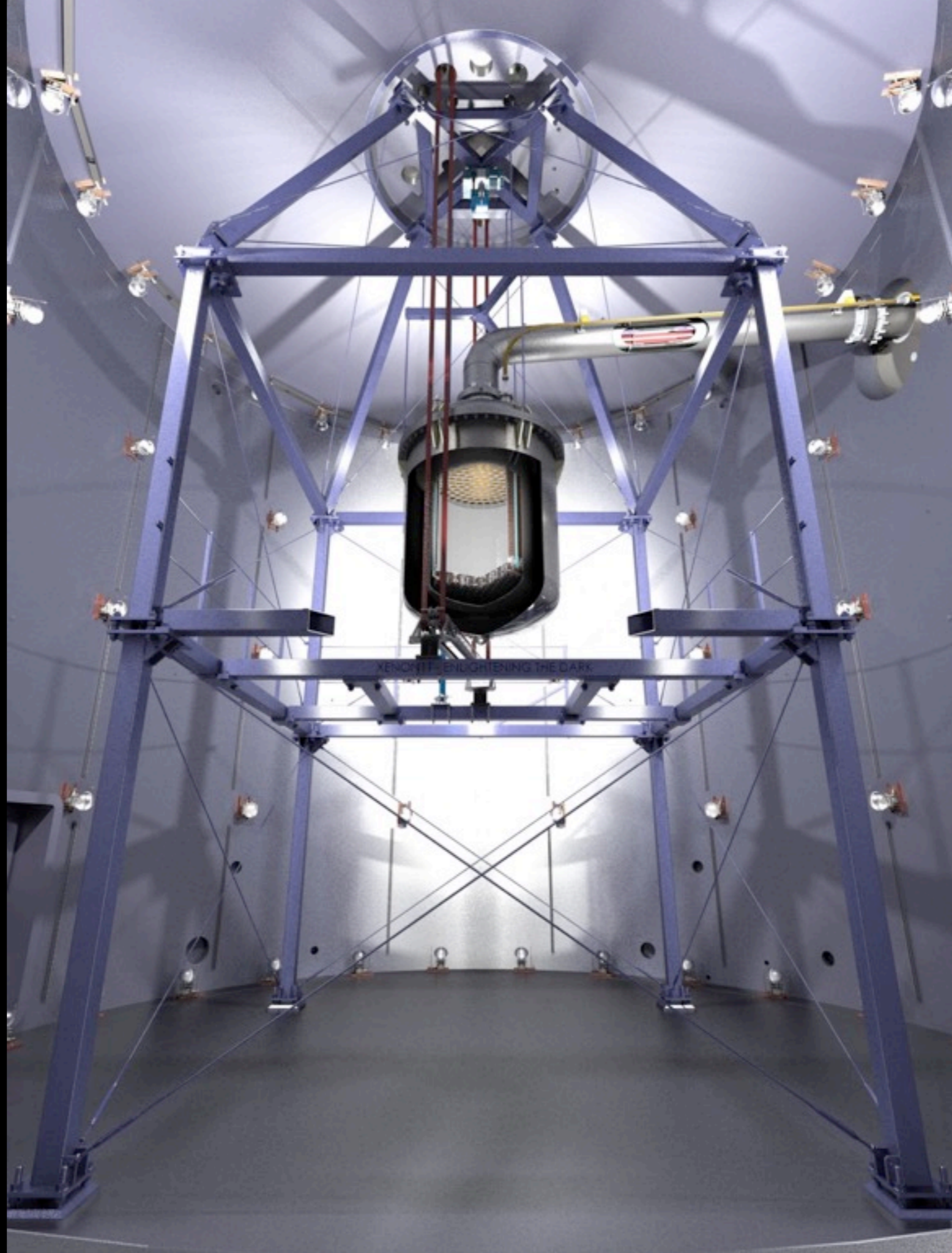




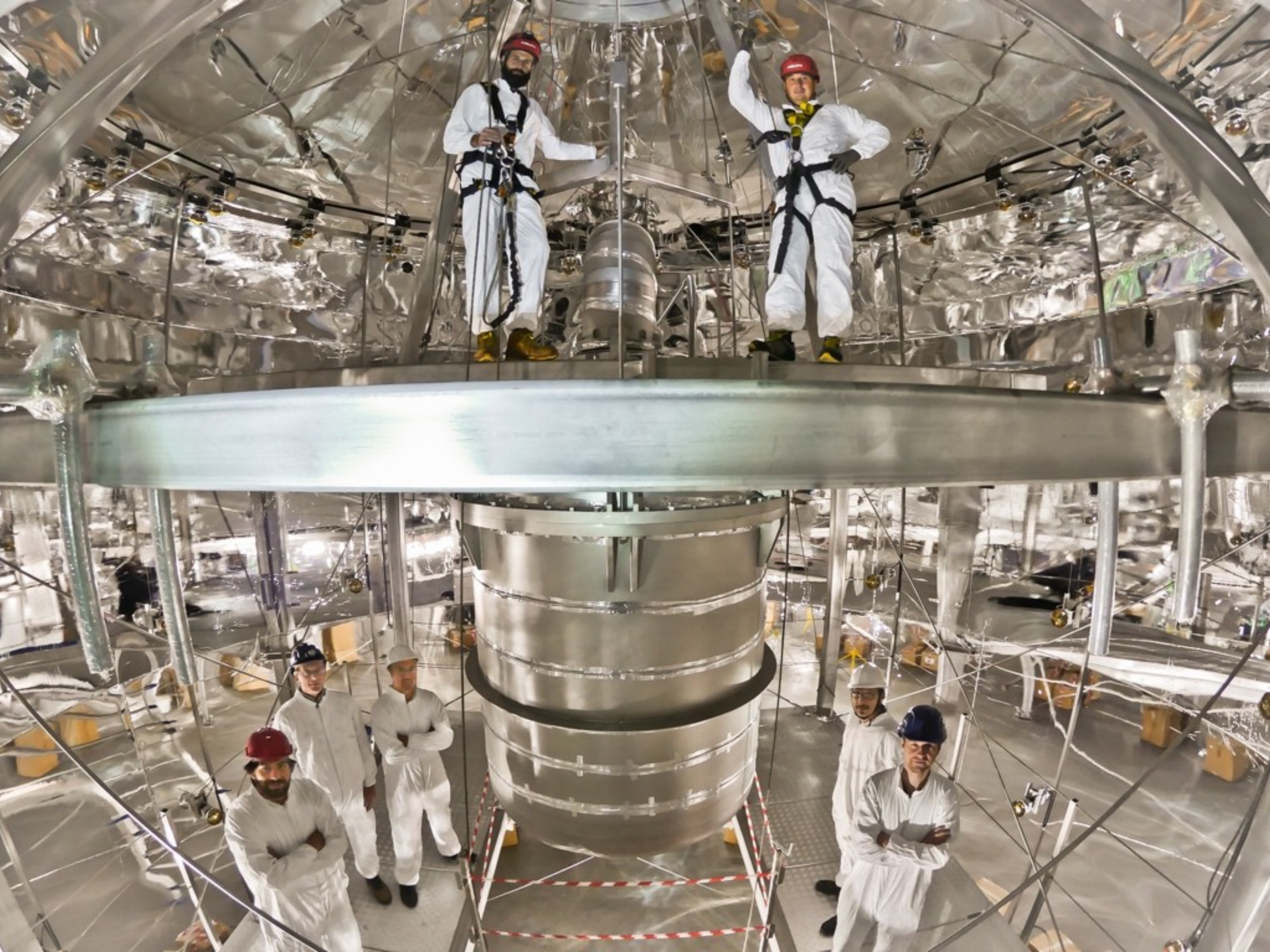








XENON1T: ENLIGHTENING THE DARK









Thank You's to Technical Dept!

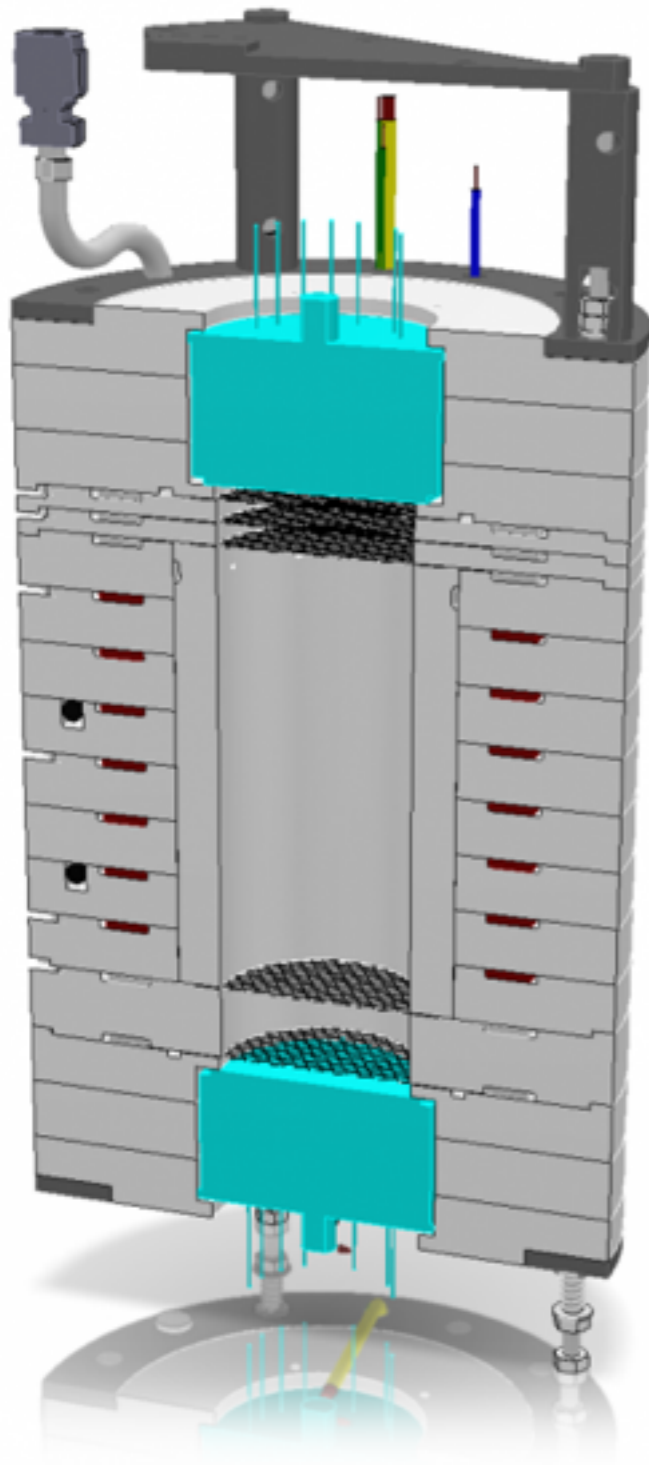
- PDP / CT Group:
 - Under Ground → Above Ground network installation and optimization, Best LINGS connectivity to any institute, DAQ hardware, general computing advice - **TRISTAN SUERINK**
 - GRID support, Tier-0 etc. - **JEFF TEMPLON, JAN-JUST KEIJSER, DAVID GROEP**
- eScience:
 - (through PathFinder Grant) ROOT - Python integration - **DANIELA REMENSKA**
- ET Group:
 - Prototype XENON I(n)T amplifier - **GUIDO VISSER, FRANS SCHREUDER**
- MT Group:
 - Design of XENON IT calibration system - **BOUDEWIJN VD KROON, ROB WALET**
 - Manufacture of many tiny TPC parts - **ROB LEGUIJT, ROB BUIS**

And many more!

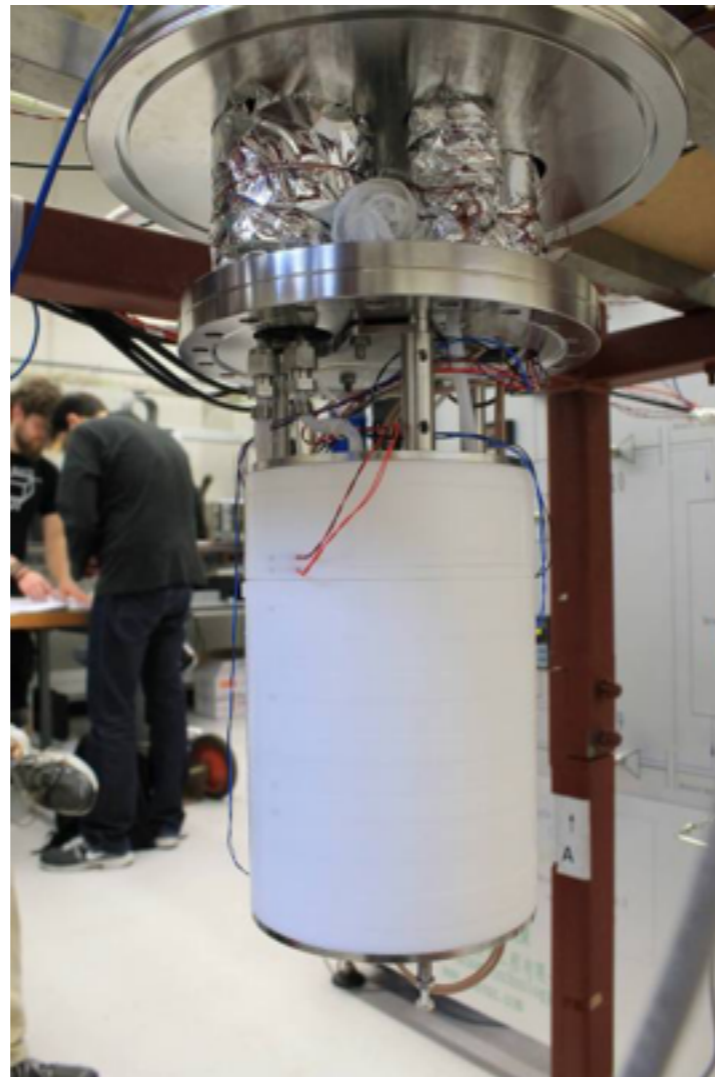
XAMS: LXe R&D @ Nikhef



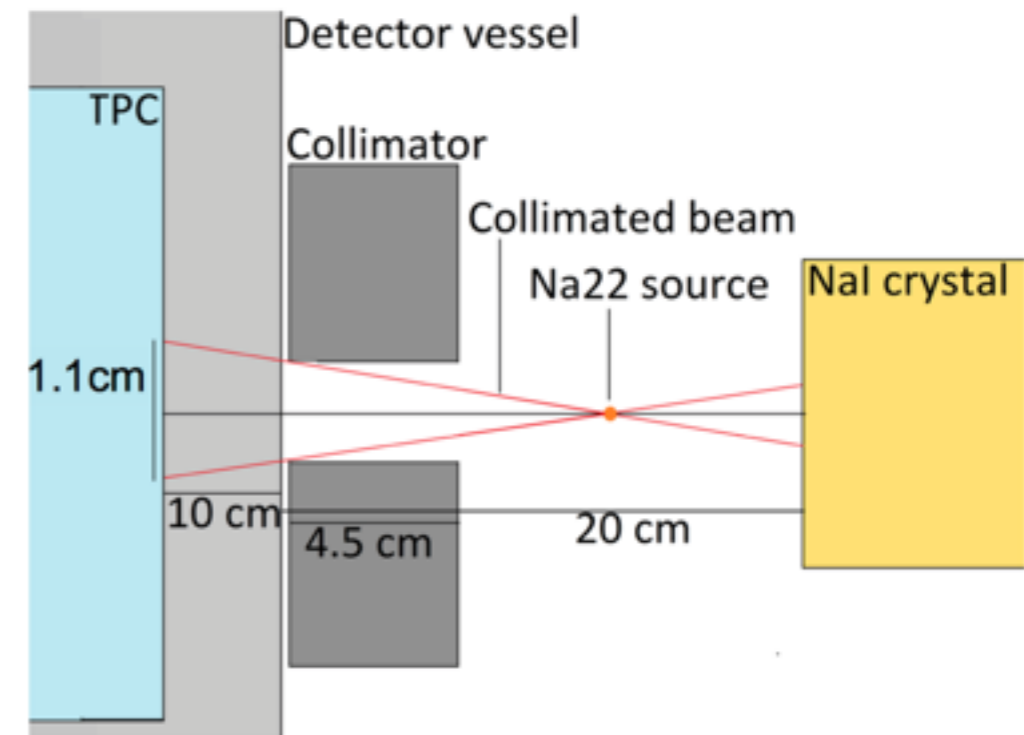
XAMS TPC



Design by
Rob Walet

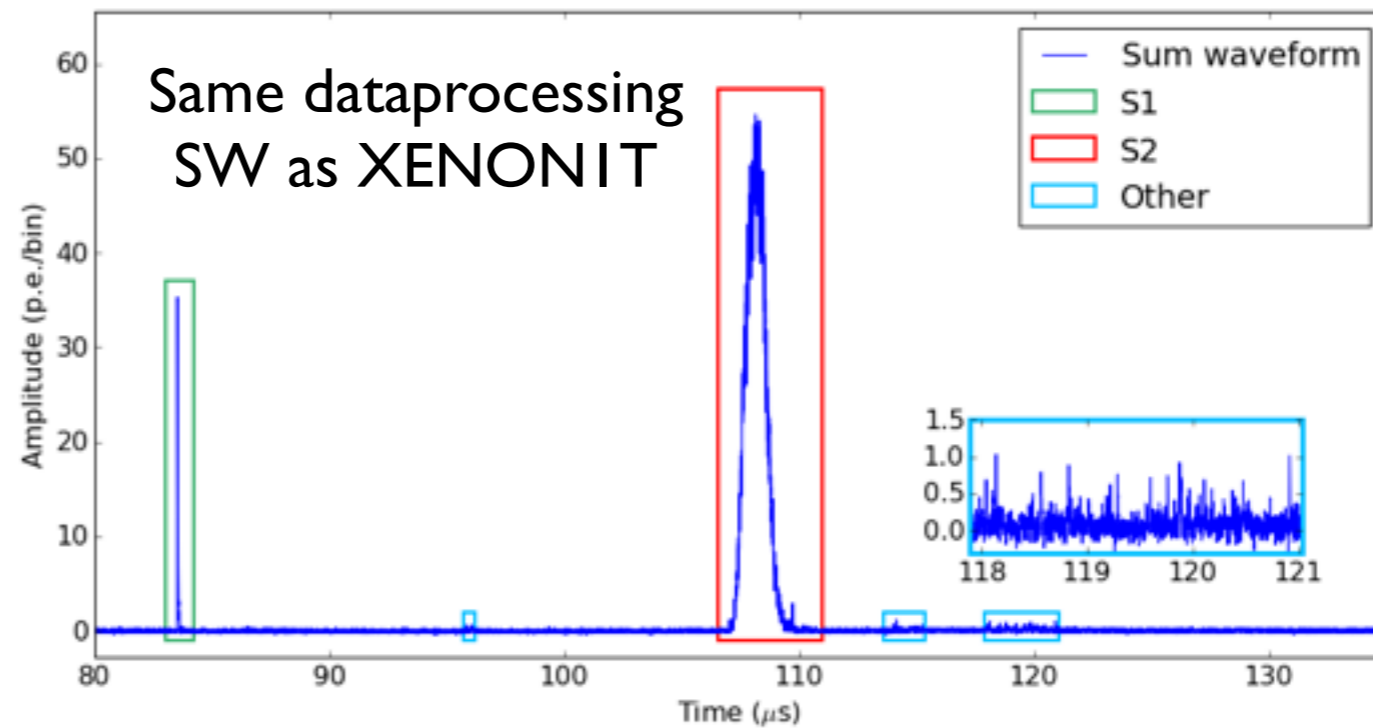
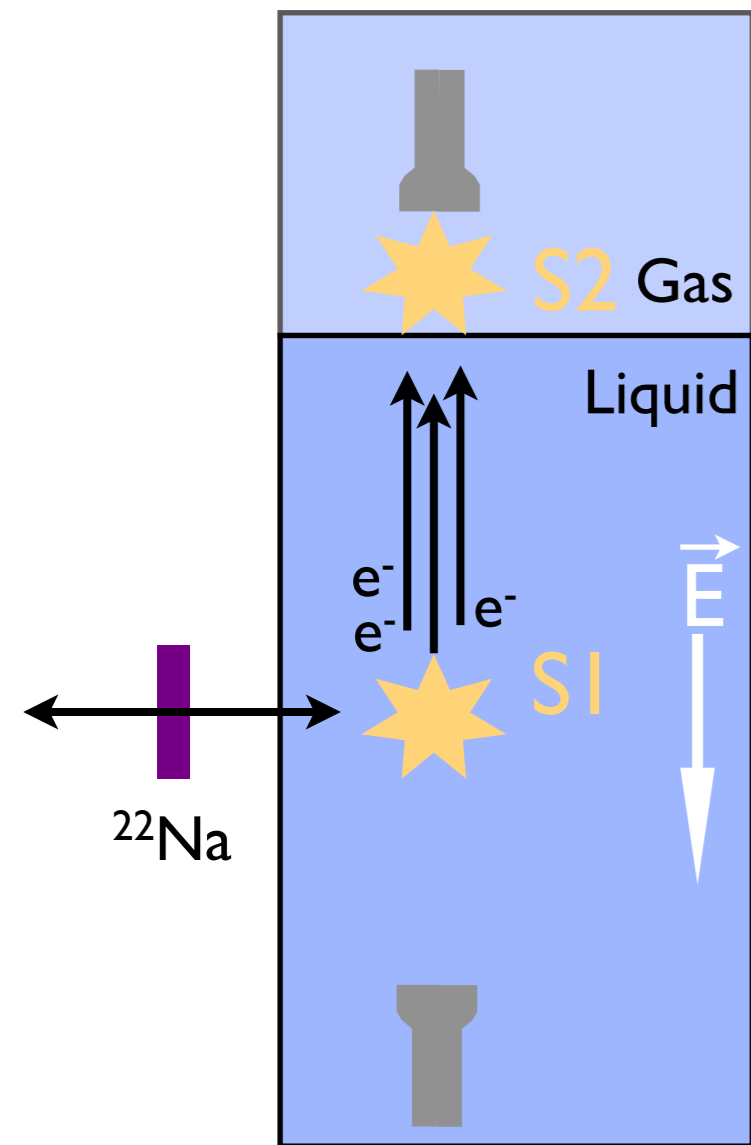


Main improvement:
tagged γ -source

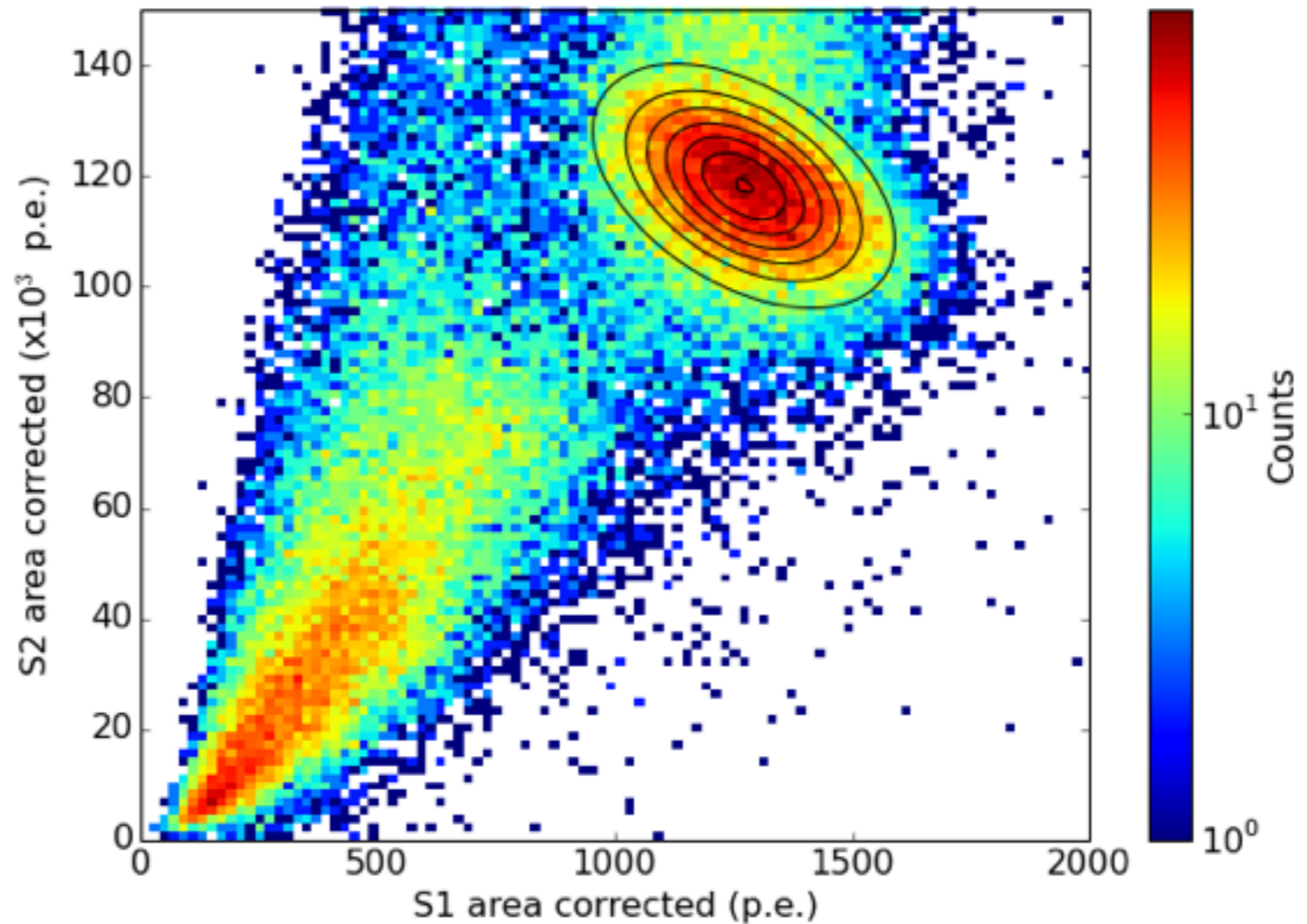
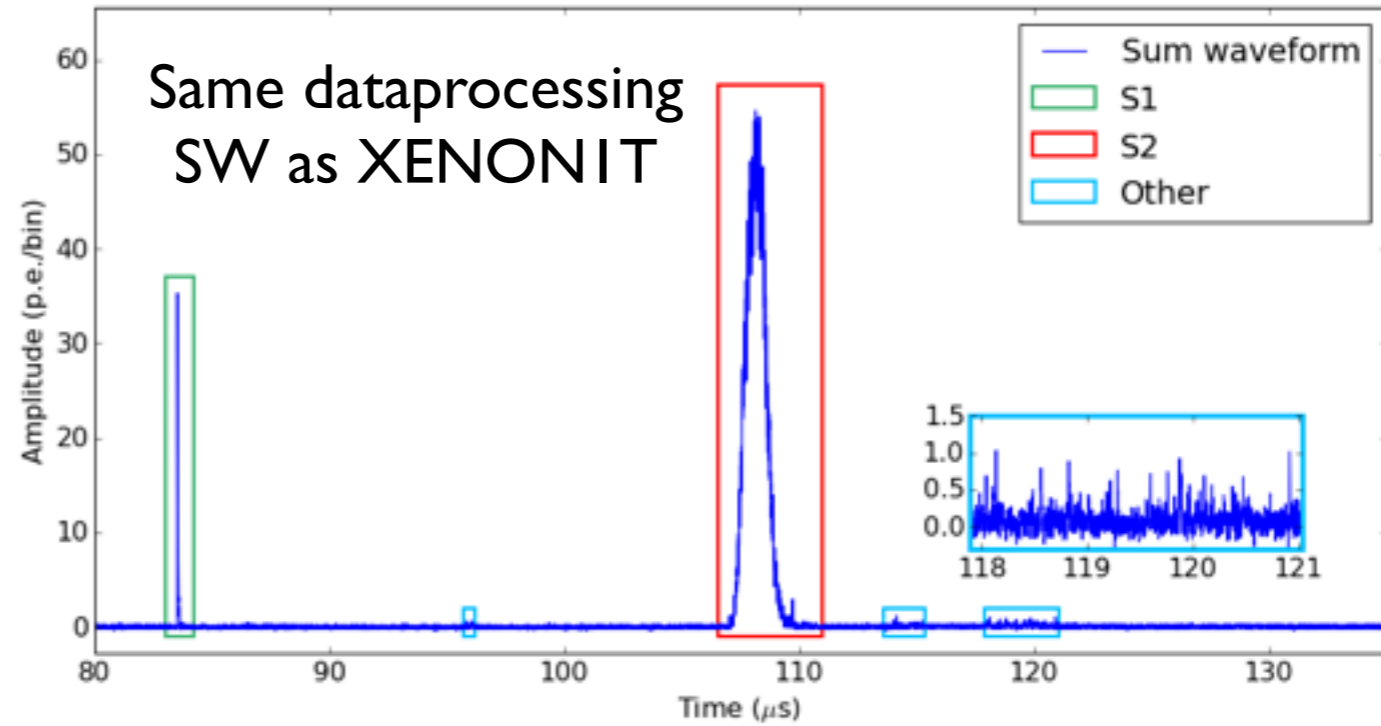
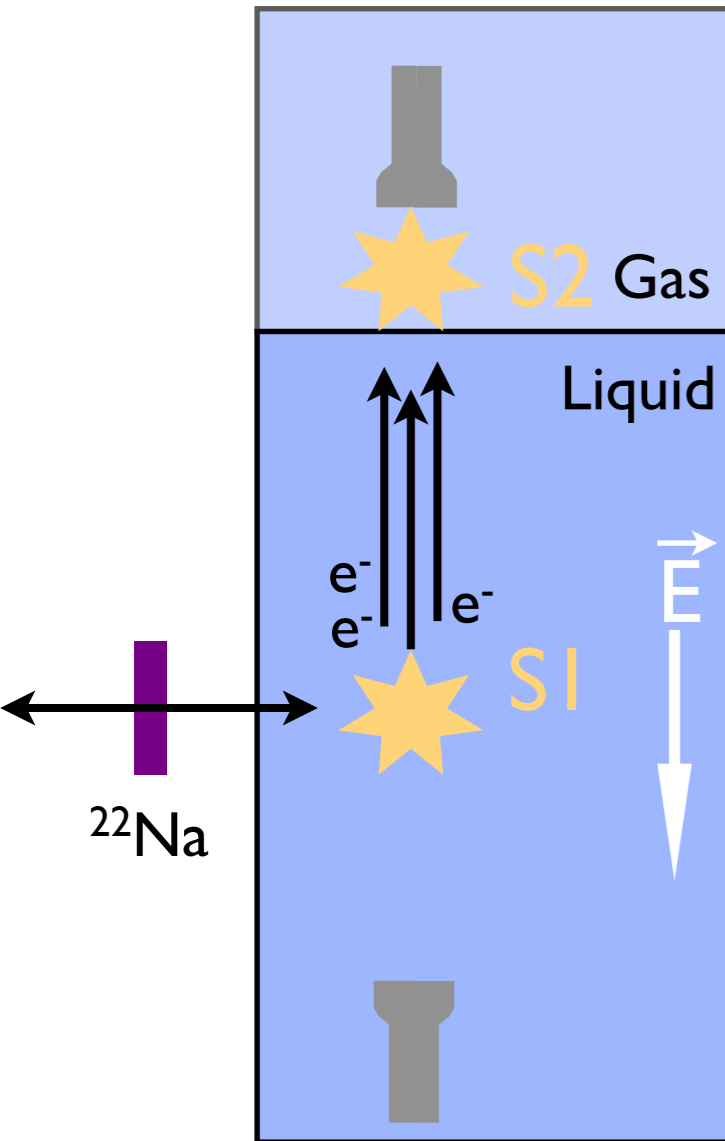


Just received permit for
an AmBe n-source

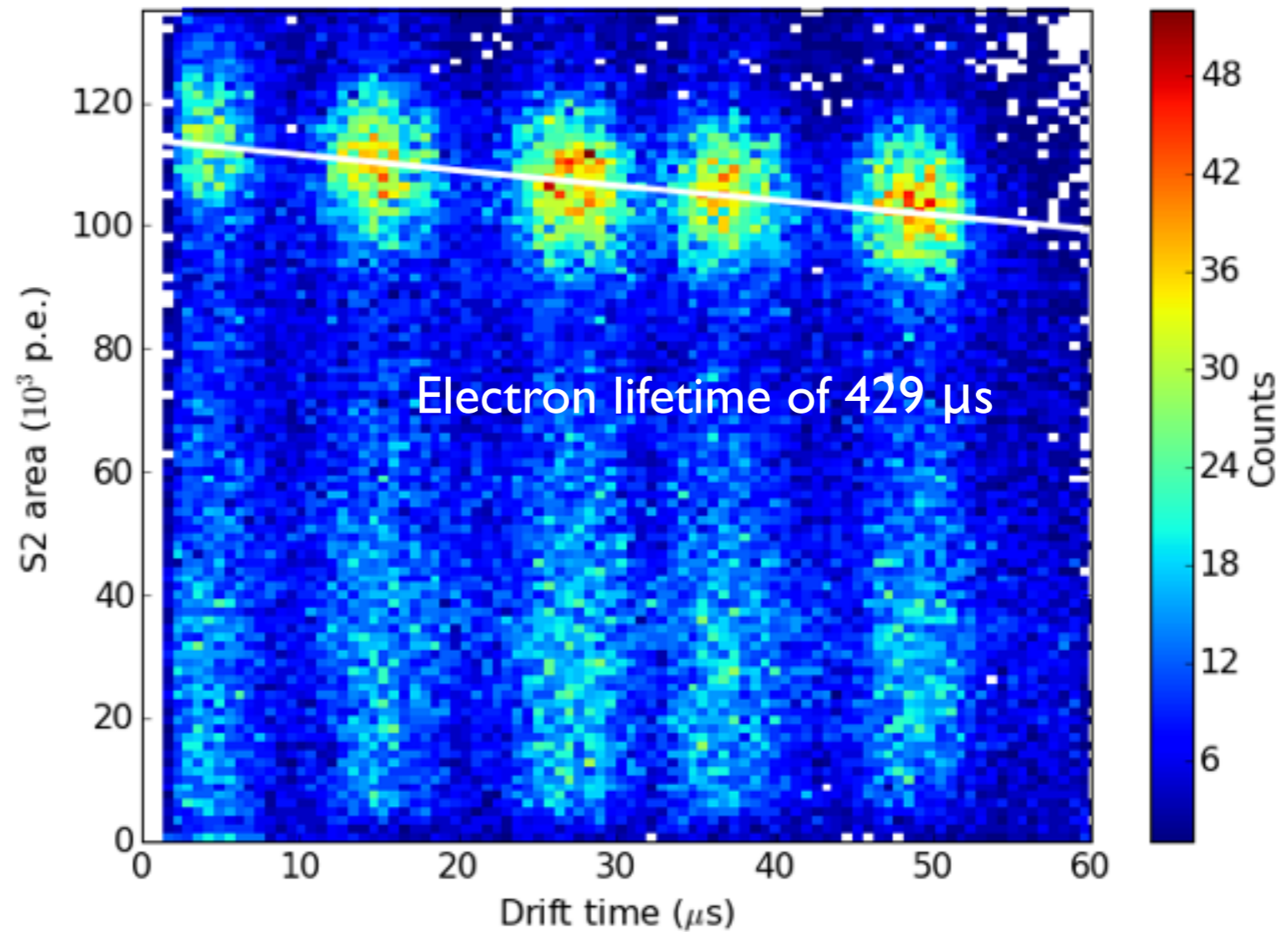
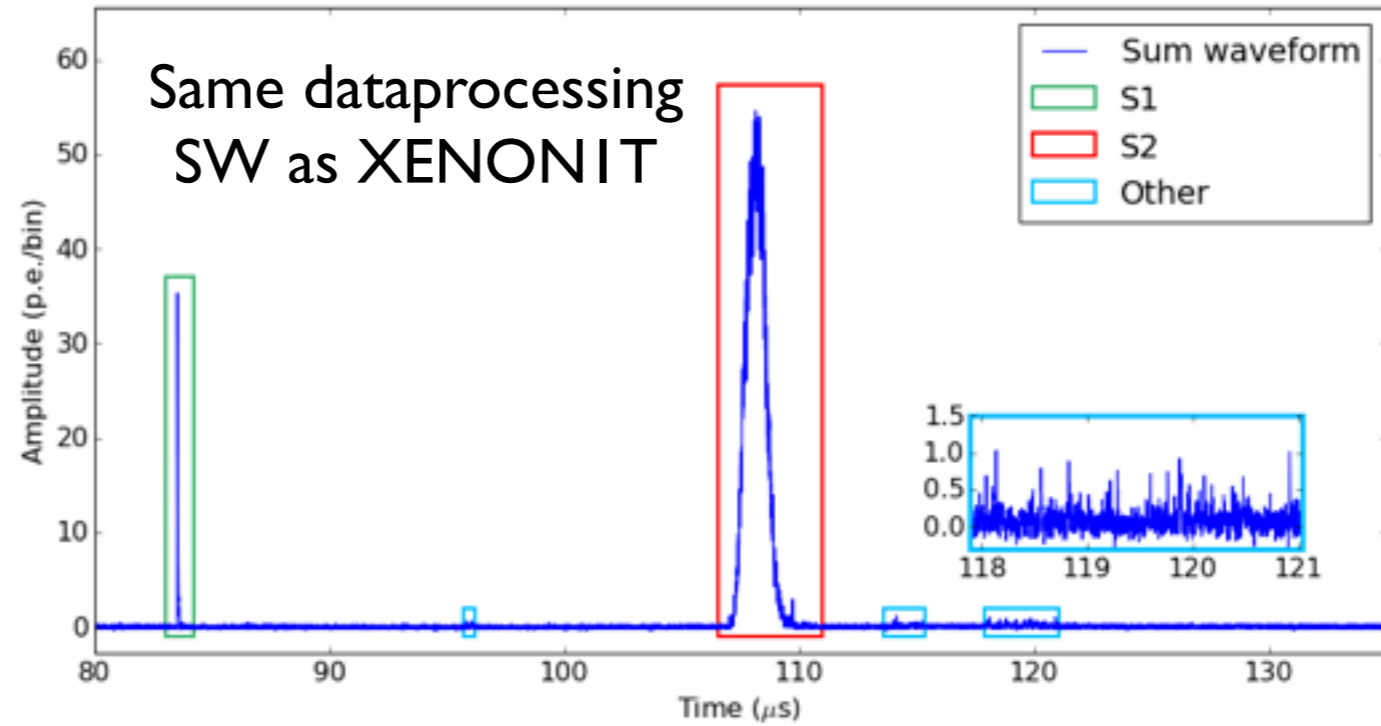
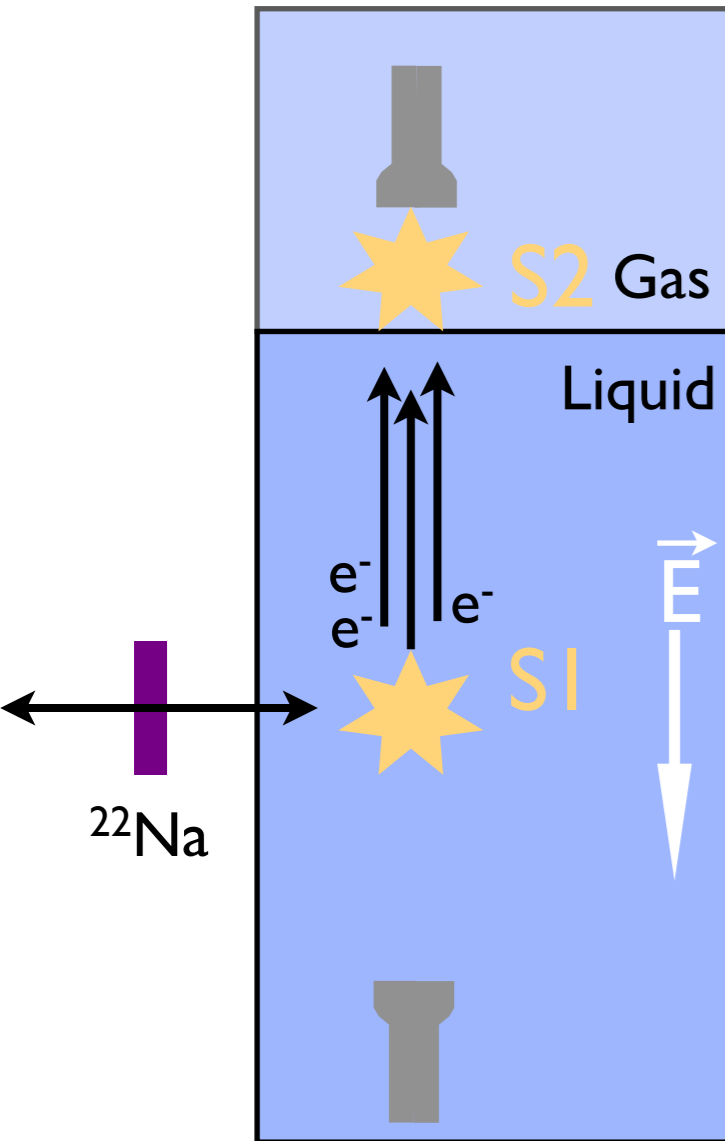
XAMS Data



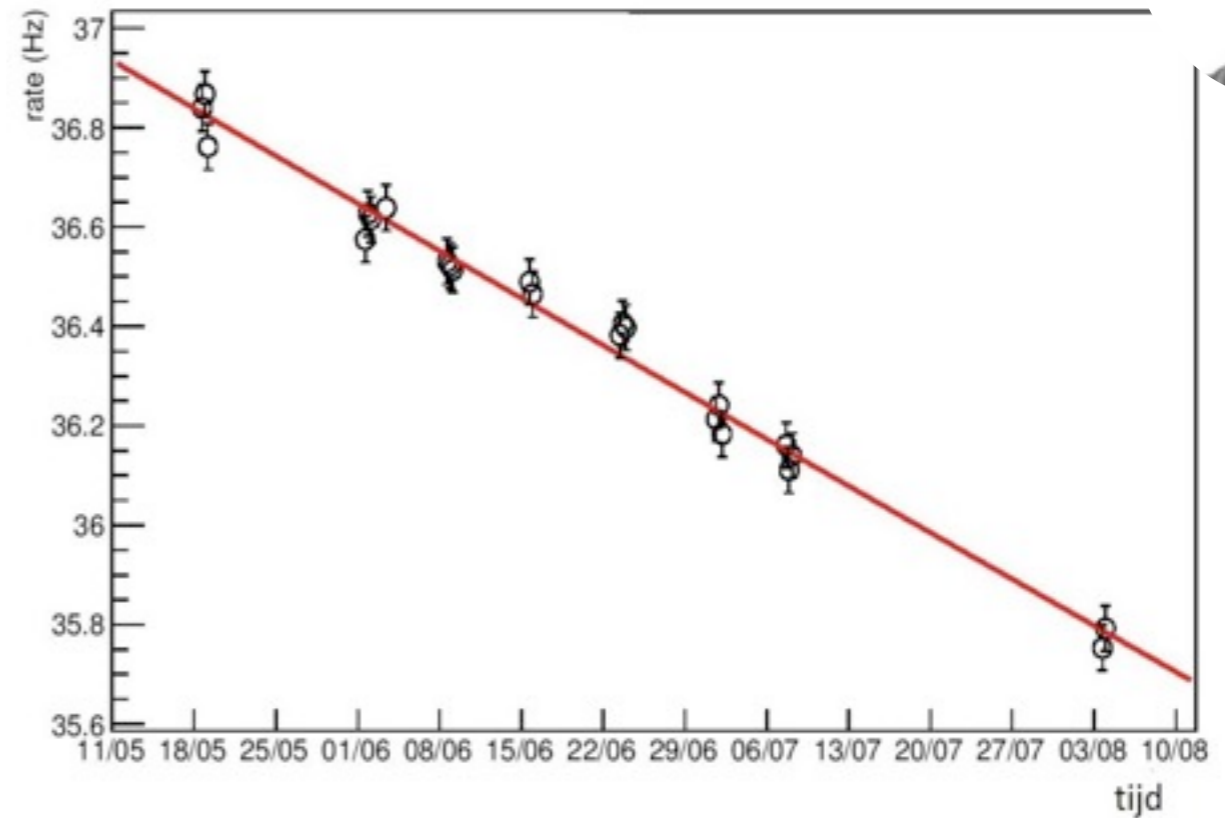
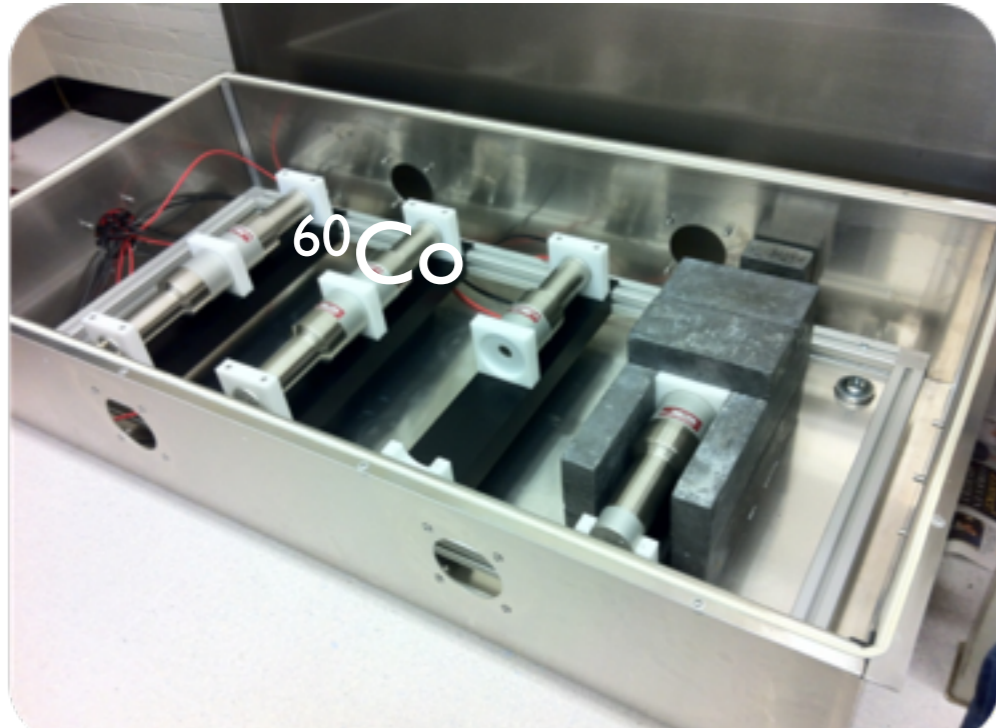
XAMS Data



XAMS Data

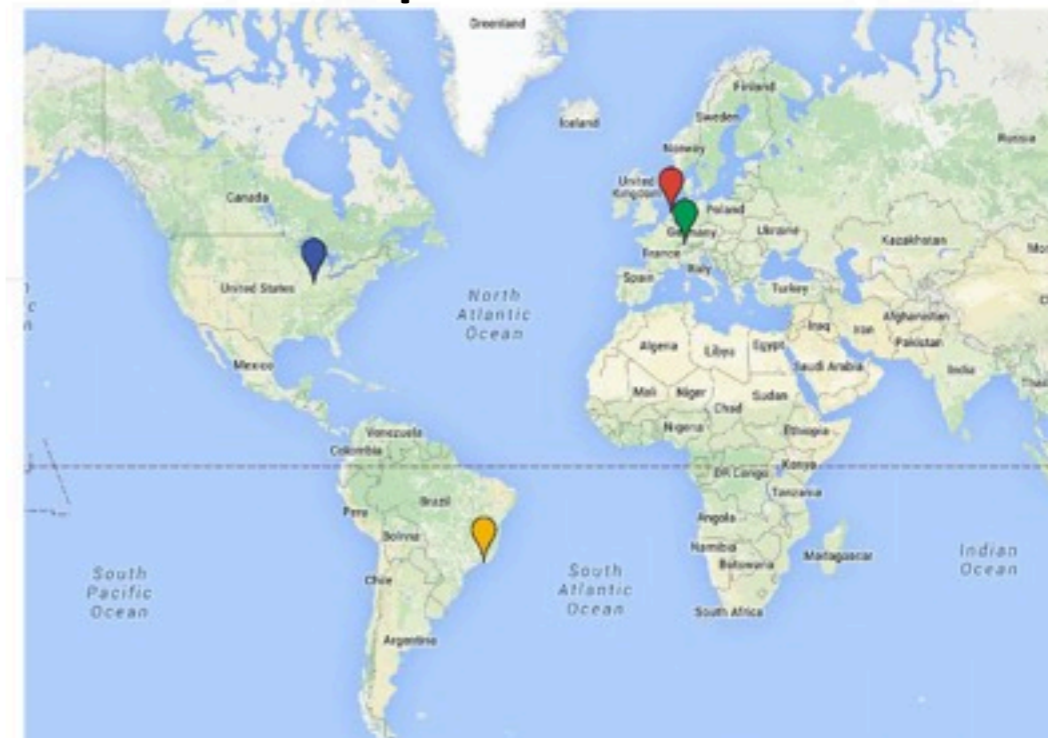


Modulation Experiment



	Cobalt-60
Half life from experiment	5.11 ± 0.17 year
Half life from literature	5.27 year

4 identical experiments:



Summary

- Dark Matter Group entering interesting time
 - XENON100 is a useful test facility and still some analyses coming out
 - XENONIT entering commissioning phase
 - Preparations for XENONnT - 2019
 - XAMS facility a testbed for analyses and becoming R&D facility

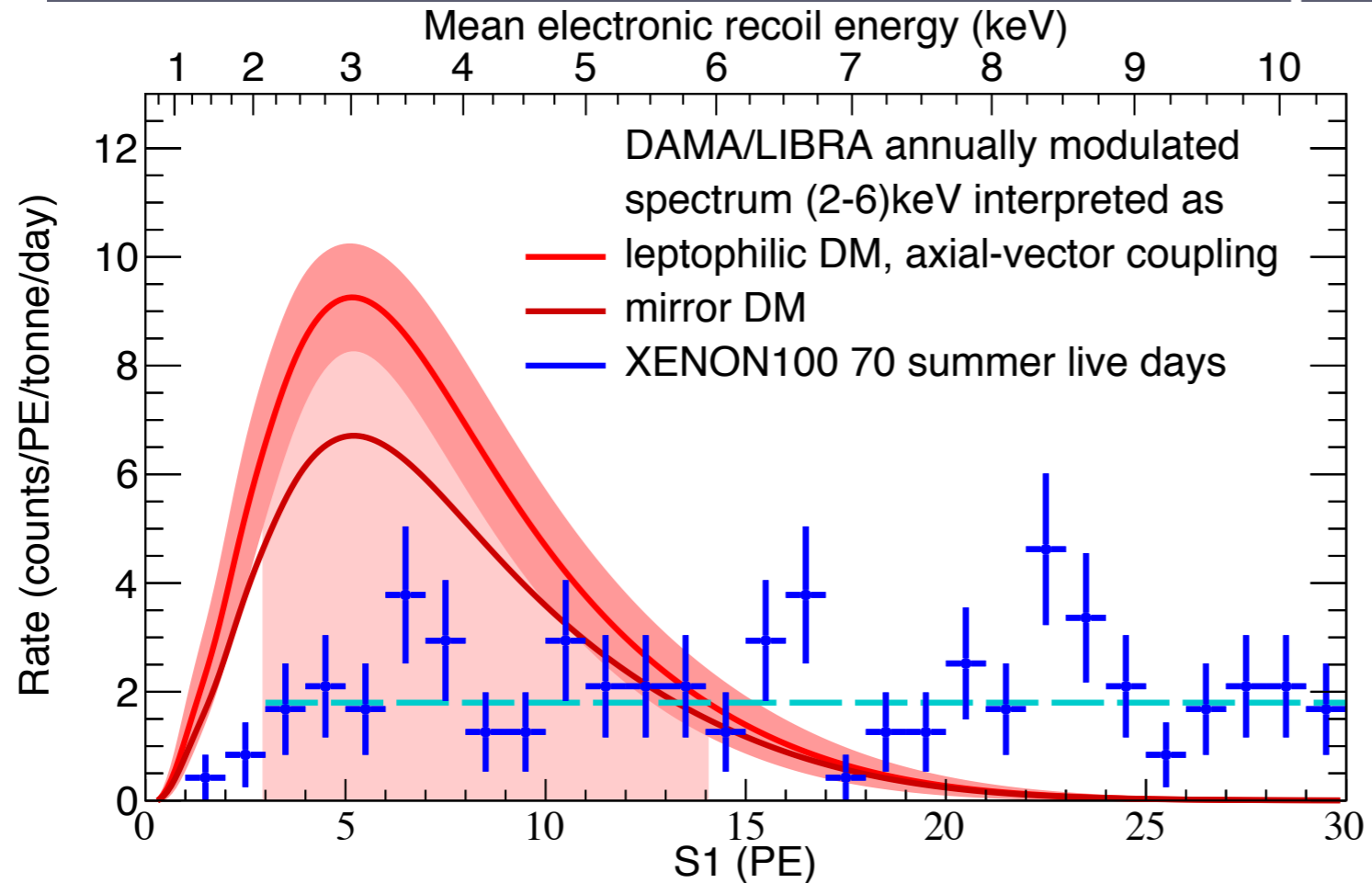
- Dark Matter
- XENON out
- XENON
- Preparati
- XAMS fac



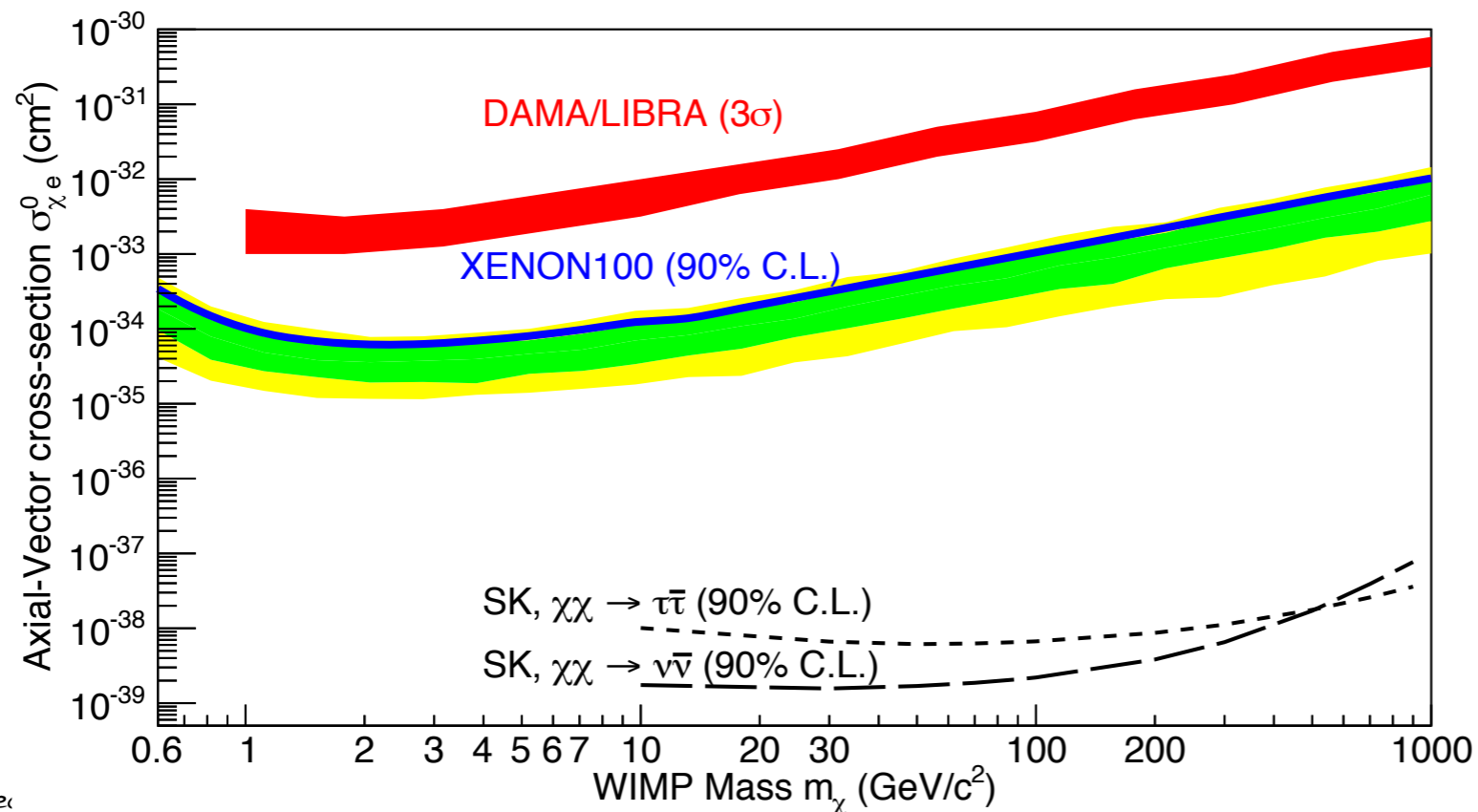
analyses coming

R&D facility

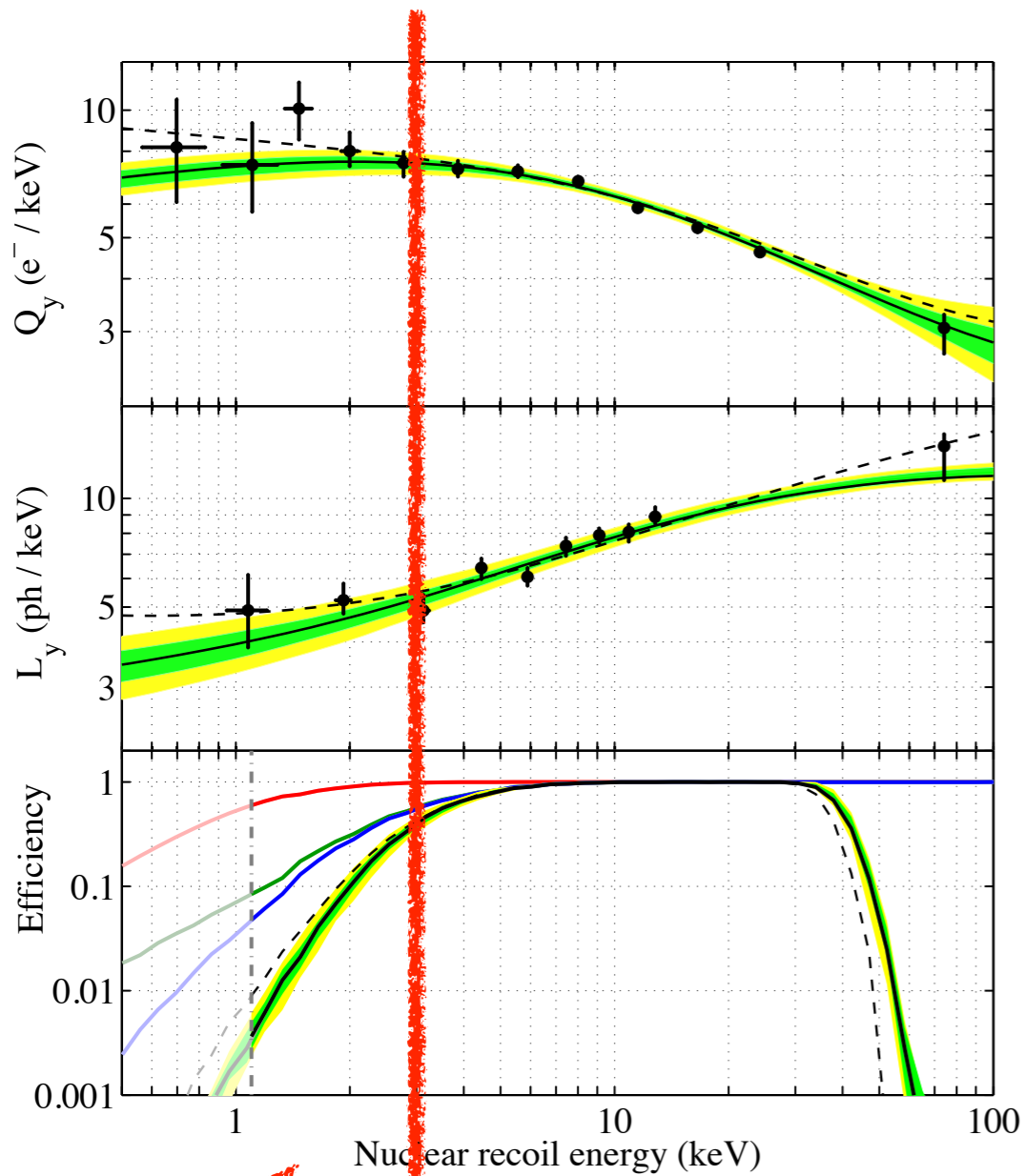
XENON100 Electro-philic DM



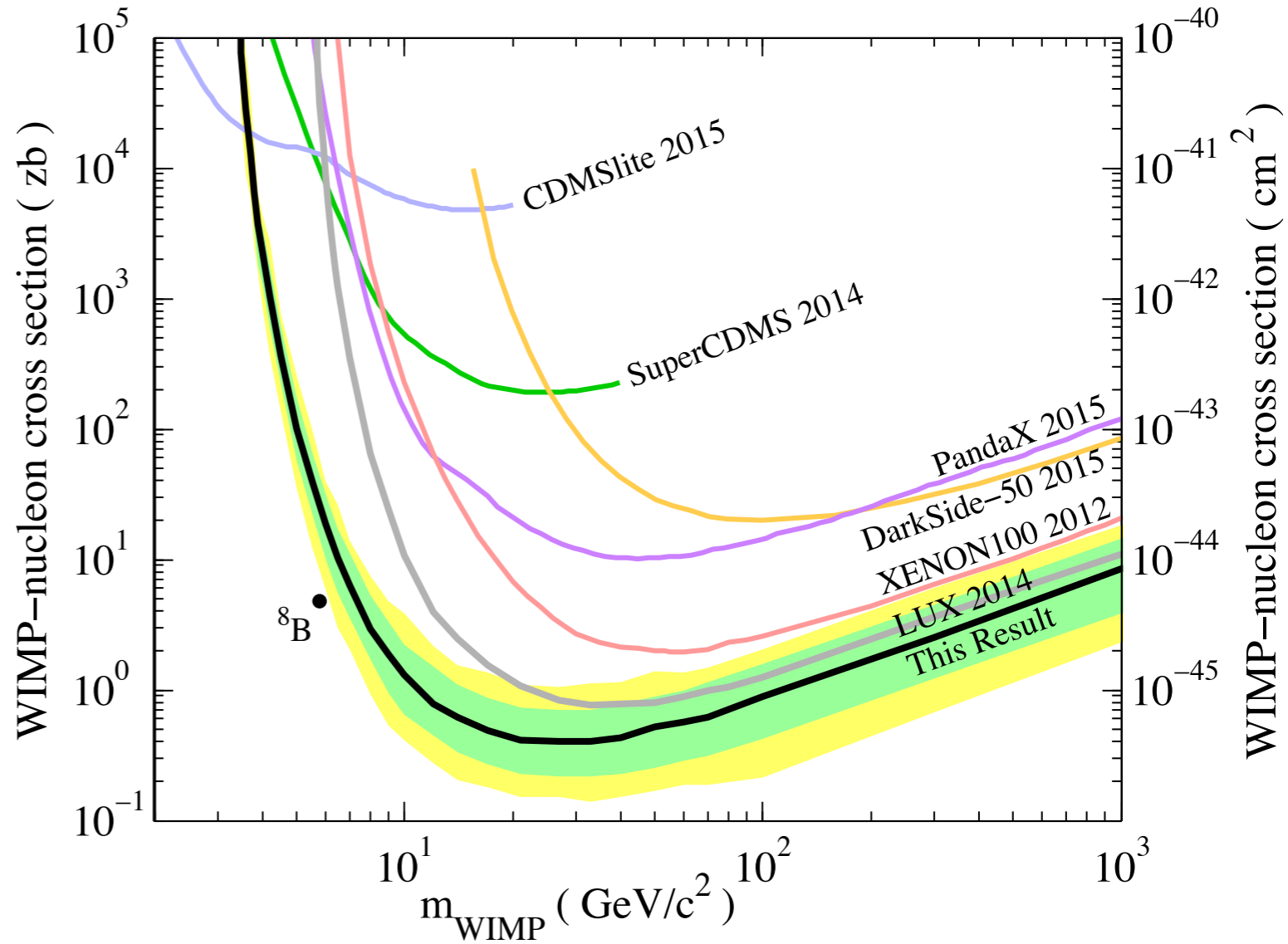
XENON100 Coll, Science 2015 vol. 349 no. 6250, 851, arXiv:1507.07747



Yesterday's New LUX results



New low E data



LUX Coll, arXiv:1512.03506