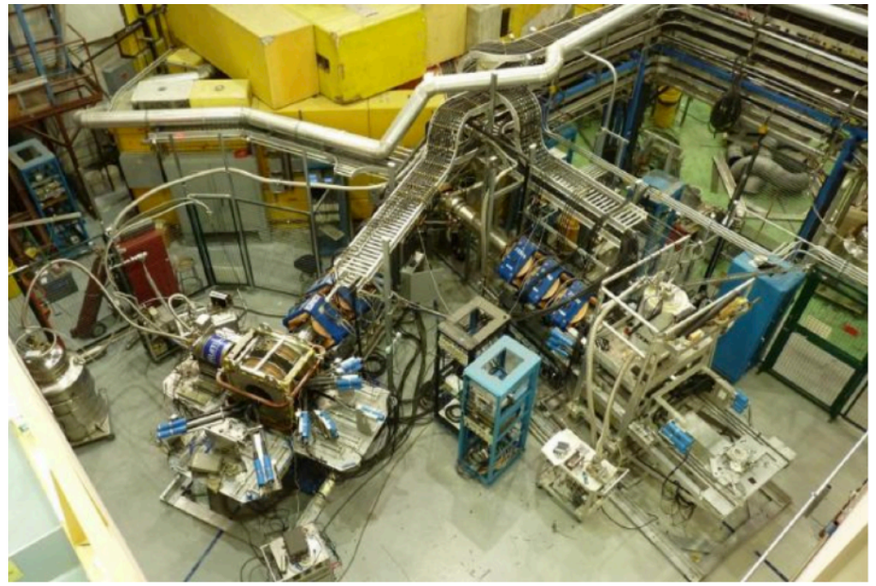
TRIUMF

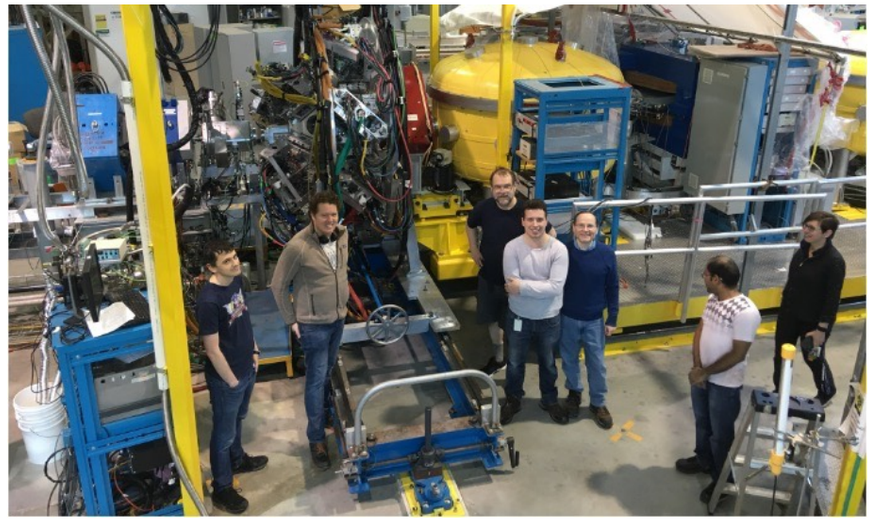
Welcome to the

PSD Mixer

July 18, 2025

Mixer Attendance - July 18th 2025

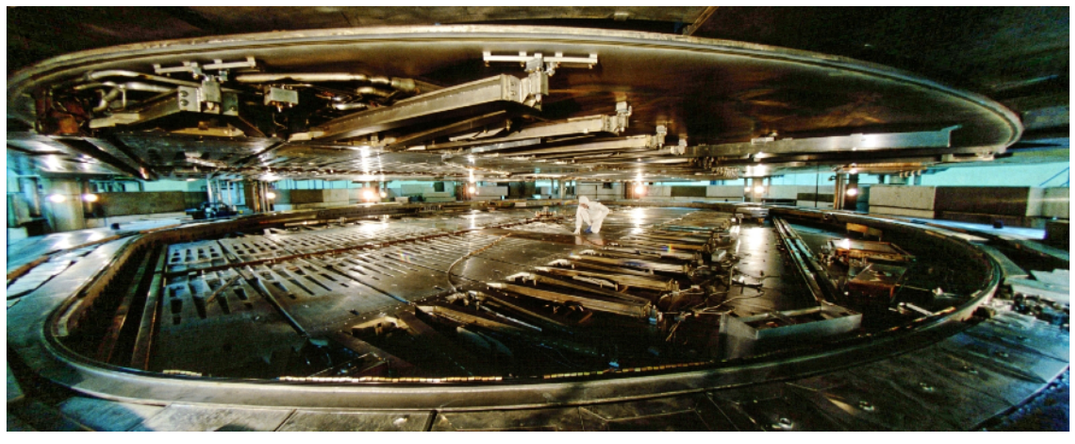




TRIUMF

TRIUMF is located on the traditional, ancestral, and unceded territory of the Musqueam people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

TRIUMF's home has always been a seat of learning.



Agenda

- **PSD Director report**
  - **Personnel news**
  - **Awards**
  - **TRIUMF News**
  - **Event News**
  - **Any other business**

- **Science talks**
  - **Chris Chambers**
    Mn mass measurements with TITAN

  - **Laura Miller**
    How to install the DarkLight experiment

- **Pizza time !**

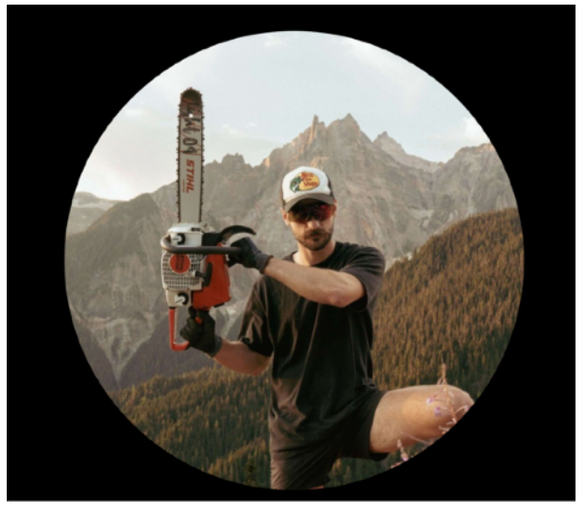
Personnel news

- **Mahdiar Khosravi,** Mechanical Engineer, joins PSD, ARIEL Experiment Operations Department.

photo courtesy: Linkedin

- **Anton Zelenin,** Mechanical Technician, joins PSD (part-time), TUCAN project

photo courtesy: Linkedin



Welcome Mahdiar and Anton !

Awards

- Congratulations to **Doug Bryman** on being awarded the honor of CAP Fellow

CAP = Canadian Association of Physicists

TRIUMF News

- Research Security
  - ✦All visitors need to have an invitation letter from TRIUMF HR
  - ✦Prior to request for letter, submit Research Security form to TRIUMF ORS
    -submit well ahead of time, as ORS is overloaded with work.

- July - September QRPP process complete.
  - PSD project resources approved :
    - ☑M9H Controls
    - ☑UCN source & nEDM (78% approved)
    - ☑RadMol electrical work
    - ☑HAICU electrical work review

  - PSD project resources not approved :
    - ☐ M9H detectors
    - ☐UCN - Design office & Machine shop
    - ☐RadMol - Research Services Office
    - ☐DarkLight MOU

TRIUMF News

❖ **Beamtime 2025**

- Cyclotron proton beam problems in May. GRIFFIN shifts lost (~ 1wk) extended by +3 shifts adjusting from TITAN (- 2 shifts) and BeEST (- 1 shift)

- Vacuum leak in BL1A led to loss of shifts for UCN and CMMS experiments (M9A, M15, M20 : 6 shifts lost for each beamline)
  Origin of the leak was moving of M11 jaws for GRIDS tutorial.

Any new work at a beamline must be approved by the facility coordinator or hall coordinator. The work must be performed and tested to be successful well ahead of beamtime.

- OLIS vacuum leak - failed ^{84}Kr pilot beam delivery to EMMA prior to start of RIB ^{93}Sr

- OLIS ^{11}B beam delivery for DRAGON was not successful in June, needs re-scheduling.

❖ **EEC Meetings**

MMS EEC July 29

TRIUMF News

Visitors at TRIUMF

- May 5: President and Vice-Chancellor of the University of Queensland, Australia
- June 2: UK Research and Innovation (UKRI) delegates
- June 3: President of the Okanangan college
- June 18: Canadian Nuclear Safety Commission (CNSC) President
- July 9 : The Honorable Melanie Joly, Minister of Innovation, Science and Industry, Government of Canada

Event News

Events Held

- Creating the Quantum Future : May 5 (SFU Harbour Centre)

"Educating the next generation of quantum leaders" - panel discussion
Chloe Malbrunot, one of the panelists

- GRIDS school, May 26 - June 6
- BeEST collaboration meeting, May 13 -15
- CAP Congress, Saskatoon, June 9 - 13
- TRISEP Summer School in particle physics, June 15 - 17
- DarkLight collaboration meeting, July 2 - 4
- 14 Julliet, Bastille Day, Consulate of France, July 14

Event News

Events Upcoming

Upcoming MuSR Conference in St. John's hosted by TRIUMF

https://indico.triumf.ca/event/537/overview

Total Registrants: (including students)	132
Canadian	30
Companions:	18
Students	23
Participants in students' day:	43
Total sponsorship	$K33

Event News

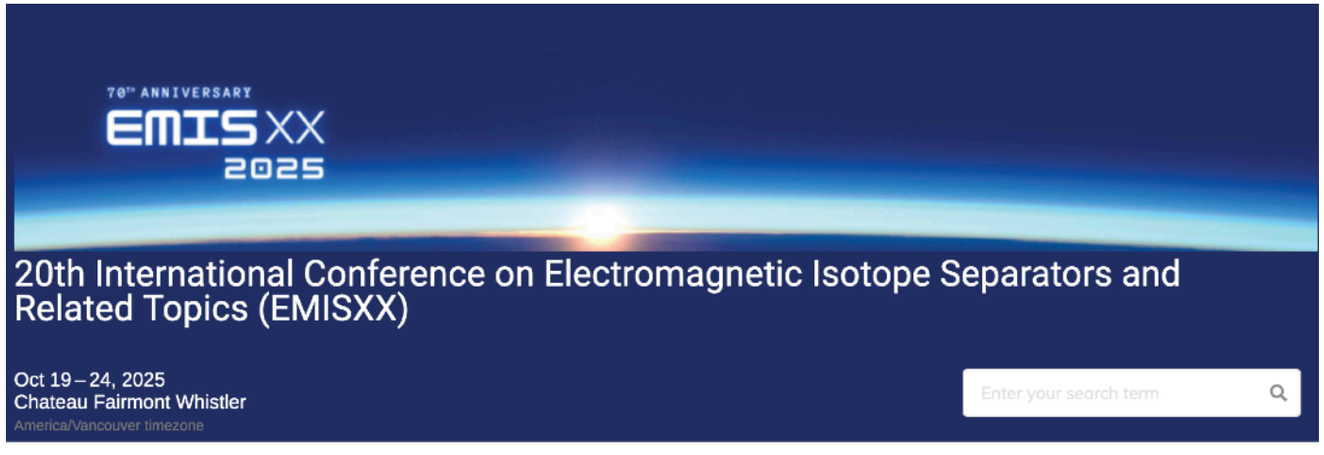
Events Upcoming

- TRIUMF Science Week : July 28 - 31

- Staff Appreciation BBQ : August 13

- PSD Division Retreat : October 3 (tentative) BAE and P&S Scientific staff

- EMIS Conference : October 19 - 24 **Early Registration Deadline : August 1**



Department News - Theory Nuclear Physics

REVIEWS OF MODERN PHYSICS, VOLUME 97, APRIL–JUNE 2025

Quantum physics of stars

M. Wiescher *et al.* including P. Navratil

Constraining Nuclear Mass Models Using r-process Observables with Multi-objective Optimization

Mengke Li,[1,2,*] Matthew Mumpower,[3,4] Nicole Vassh,[5] William Samuel Porter,[2] and Rebecca Surman[2]

Submitted to Phys. Rev. Lett.

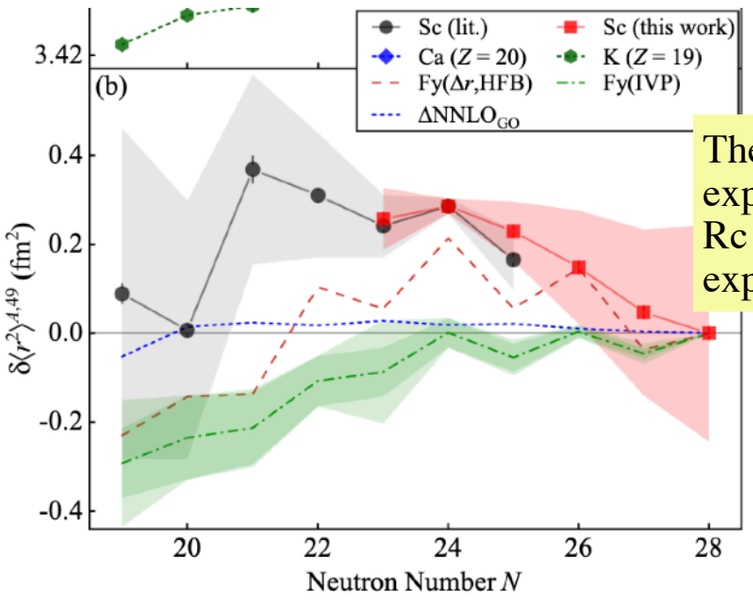
New multi-objective optimization of ML method to predict masses extrapolated to neutron-rich isotopes gives better predictions.

PHYSICAL REVIEW LETTERS 134, 182501 (2025)

Experiment @ CERN- ISOLDE

Charge Radii of Neutron-Rich Scandium Isotopes and the Seniority Symmetry in the $0f_{7/2}$ Shell

S.W. Bai *et al.* including J.D. Holt



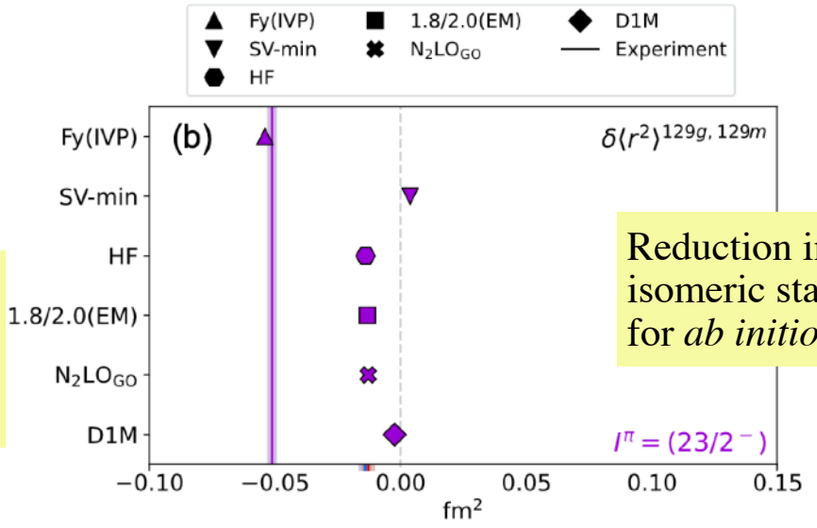
Theoretical predictions unable to explain the relative evolution of Rc from $^{40\text{-}49}$Sc. Evolution explained by seniority model.

PHYSICAL REVIEW LETTERS 134, 252501 (2025)

Experiment @ CERN- ISOLDE

Reduction in Nuclear Size and Quadrupole Deformation of High-Spin Isomers of ^{127,129}In

A.R. Vernon *et al.* including J.D. Holt



Reduction in charge radius for isomeric state in ^{129}In - challenge for *ab initio* theory

Department News - Theory

Particle Physics

- P.Asadi, M. Moore, D. Morrissey, and M. Shamma,

"Genesis of Baryon and Dark Matter Asymmetries through Ultraviolet Scattering Freeze-in,"

[arXiv:hep-ph/2405.22710] (to be submitted to the Journal of High Energy Physics (JHEP))

- **TRISEP School for particle physics**

Guest speaker : Marcela Carena,
Director of the Perimeter Institute

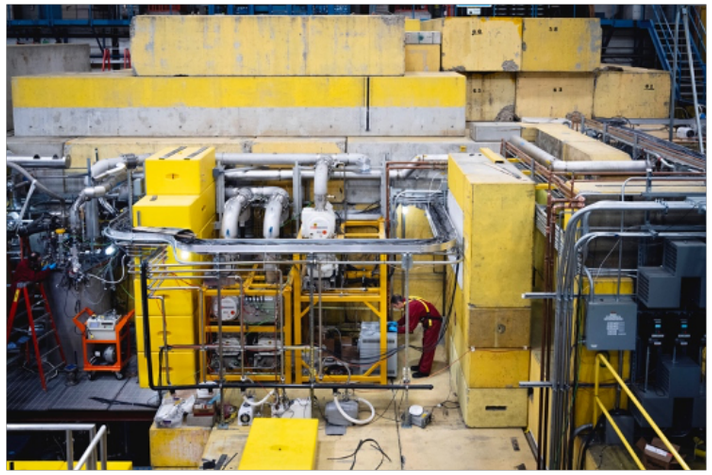
- Discussions underway with Perimeter Institute about postdoc exchange program. MOU in preparation.

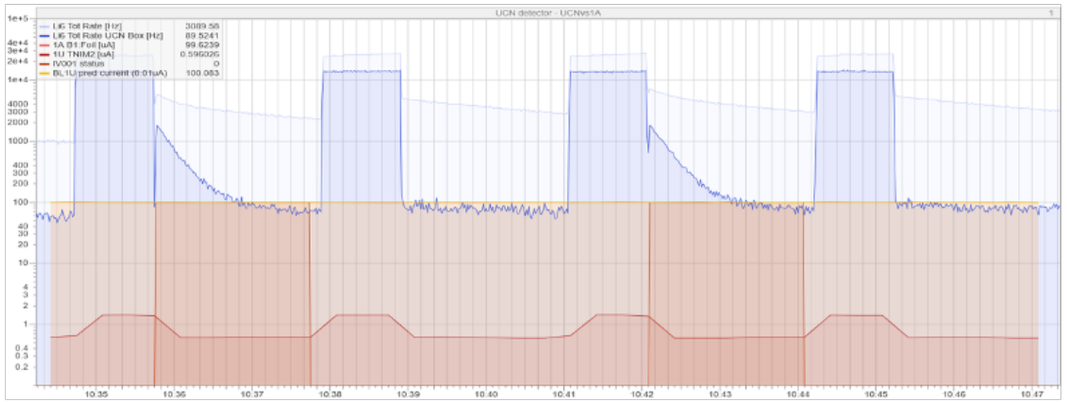
Department News - Particle Physics

TUCAN

- UCN production on Friday June 13th! Major milestone with new source
- After subtracting background see 26000 UCN per shot (within 15 % from predictions)

TUCAN
TRIUMF Ultracold Advanced Neutron Collaboration





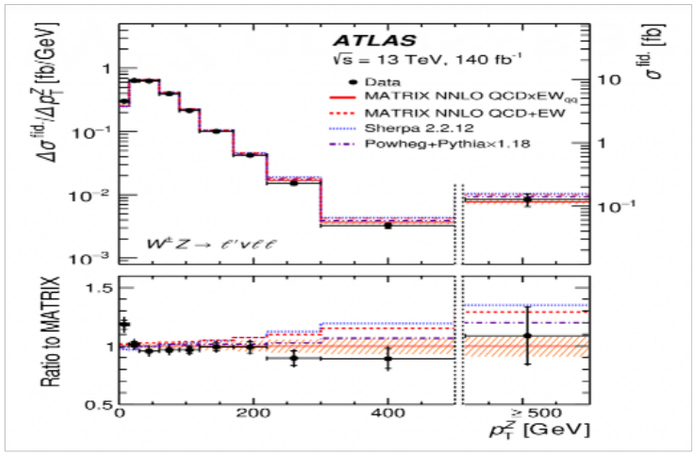
DarkLight

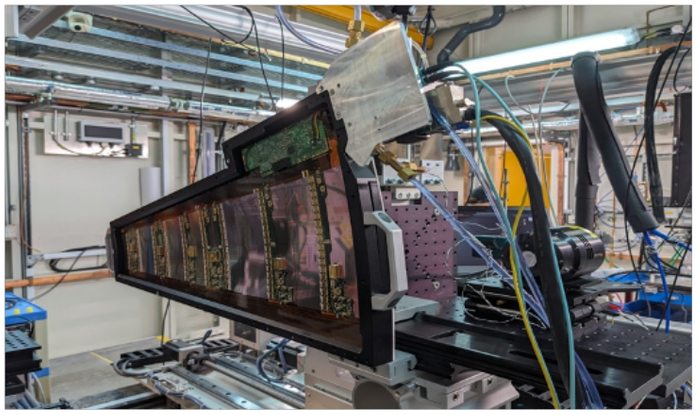
- Installation complete!
- TRIUMF received the amendment to the ARIEL Licence to include Darklight experiment from CNSC
- Gate 4a and SRCD complete
- Commissioning imminent – *hear more during Science Talk!*

Department News - Particle Physics

ATLAS

- WZ Full Run 2 Inclusive Cross-Sections paper 4% accuracy (with EFT interpretations) Submitted to JHEP (shown at EPS)
  - Juan Cristóbal main analyzer (working on this with Rob and Isabel)
- Collided p-O, O-O and Ne-Ne past week, all for the first time
- ITK: Current test beam at Diamon Light Source in UK ->
- New papers (both submitted to JINST in the last month)
  - "Silicon Wafer Fracture Stress for Tracking Sensors in Particle Physics Experiments", Luise Poley
  - "Test beam measurements and computer simulations of the ATLAS ITk R2 silicon strip detector", with N. Hessey, S. Manson, P. Speers and L. Poley

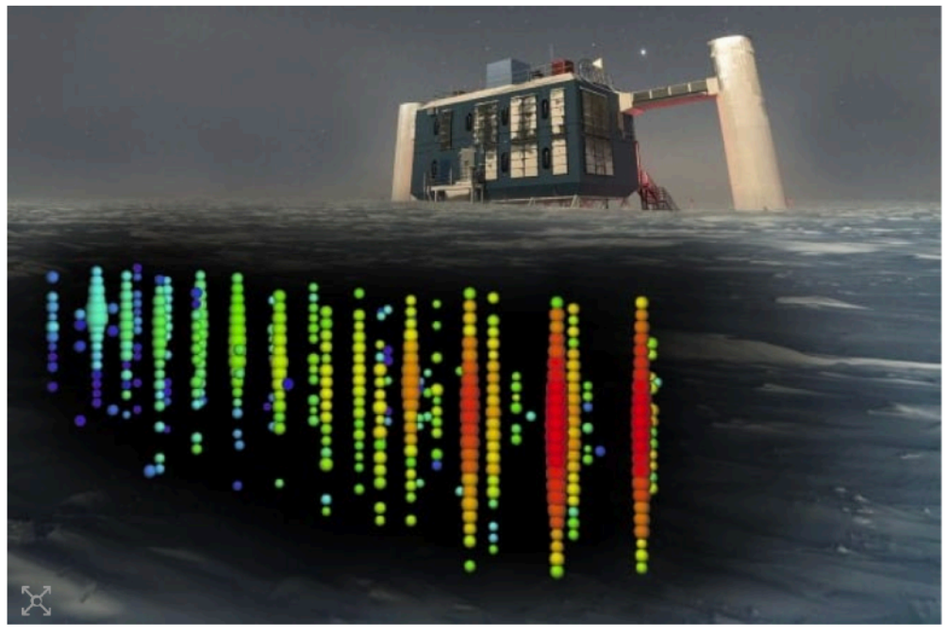




Hyper-K

- Completed the Water Cerenkov Test Experiment at CERN
- Data analysis ongoing with workshop at TRIUMF Aug 4th – 8th
- HYPER-K cavern excavation is almost complete (press release)
- Construction of Hyper-K started

Department News - Particle Physics

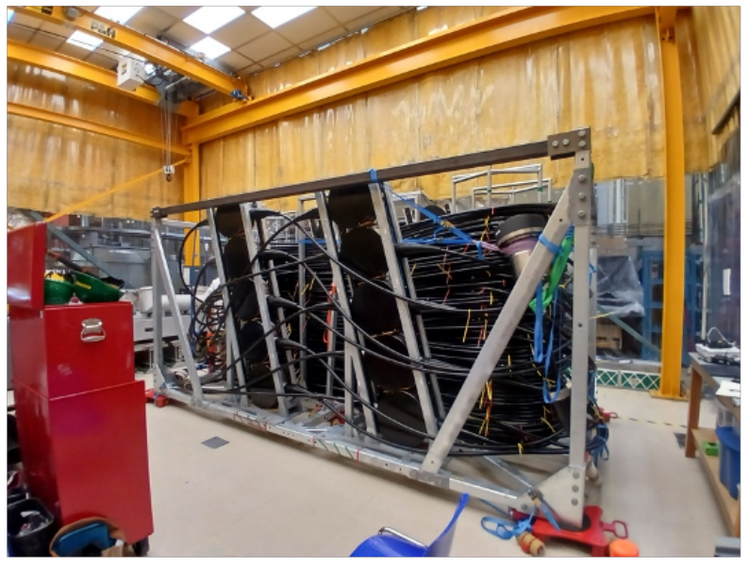


Ocean bound: P-ONE will consist of seven groups of 10 detector strings, creating an instrument larger than the existing IceCube experiment (pictured). (Courtesy: IceCube Collaboration/NSF)

Pacific Ocean Neutrino Experiment

P-ONE

- First detector line: backbone cable and all detector components have arrived at TRIUMF end of June for final detector integration and testing
- This marks a huge milestone for P-ONE and we are all grateful to members of SciTech, OPs team, and DAQ team for their support



Department News - Nuclear Physics

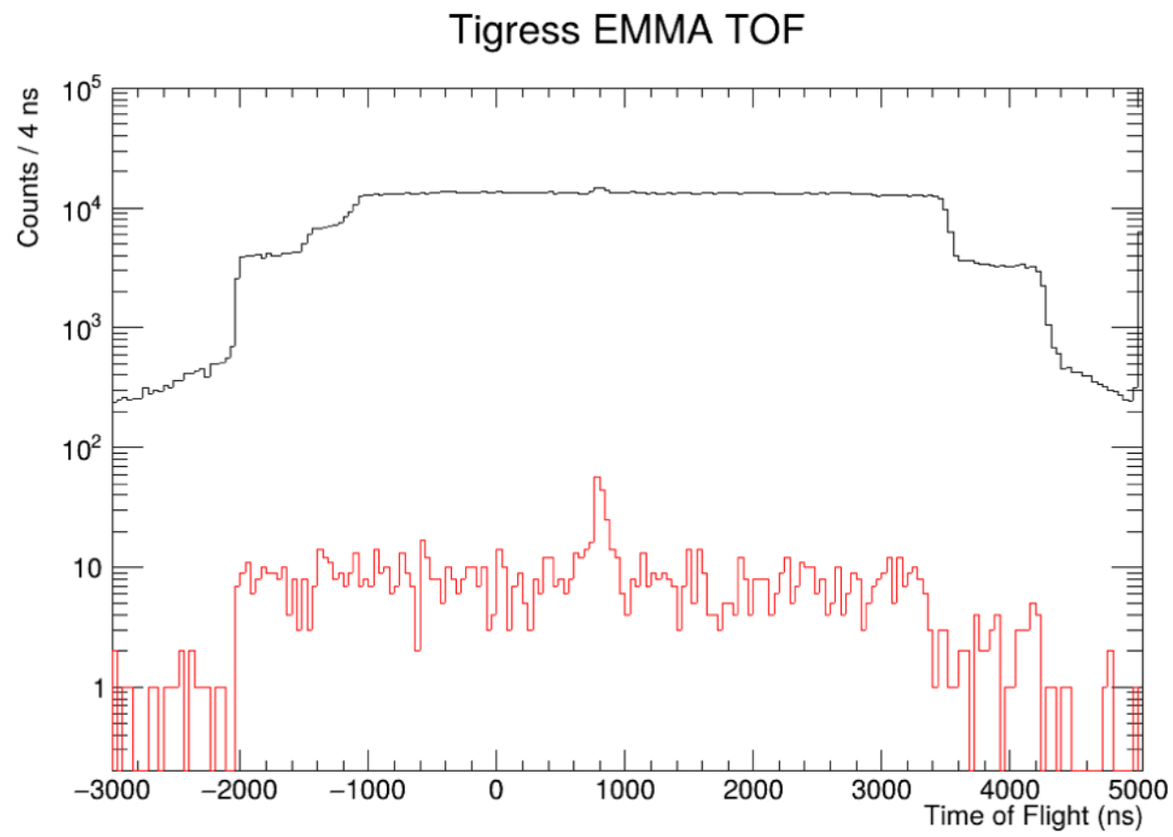
First Measurement of the ^{93}Sr(α,n)^{96}Zr Reaction

EMMA + TIGRESS

Spokesperson : Matthew Williams, University of Surrey, UK

• Used neutron detectors at EMMA to assist analysis of second (α,n) reaction studied at EMMA using a radioactive beam and novel Si:He targets.

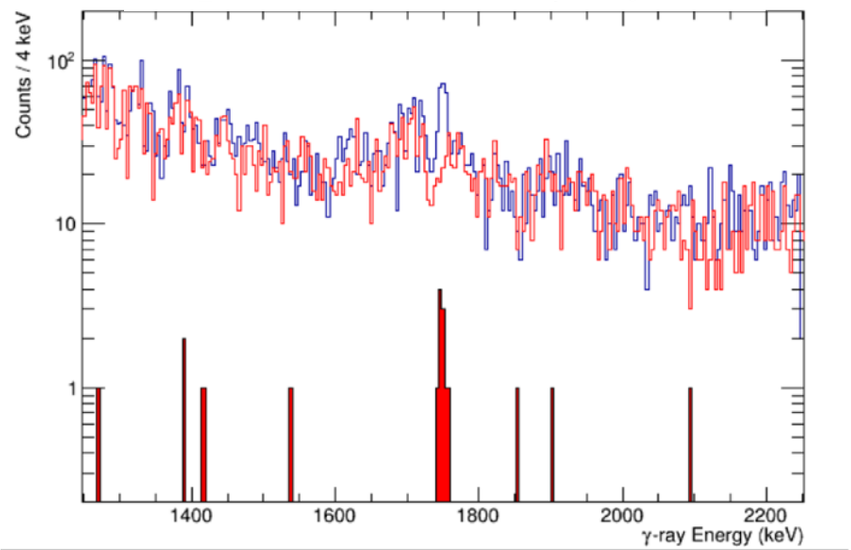
•Neutron-gated events at EMMA assisted in setting cuts on focal plane detector signals (not possible with just EMMA-TIGRESS coincidences), which cleans up the EMMA-gated TIGRESS spectra.



EMMA-DEMAND (neutron-gated) coincidences suppress background events by approximately 3 orders of magnitude.

Note that the ^{93}Rb beam contaminant is a β-delayed neutron emitted (~1% branch).

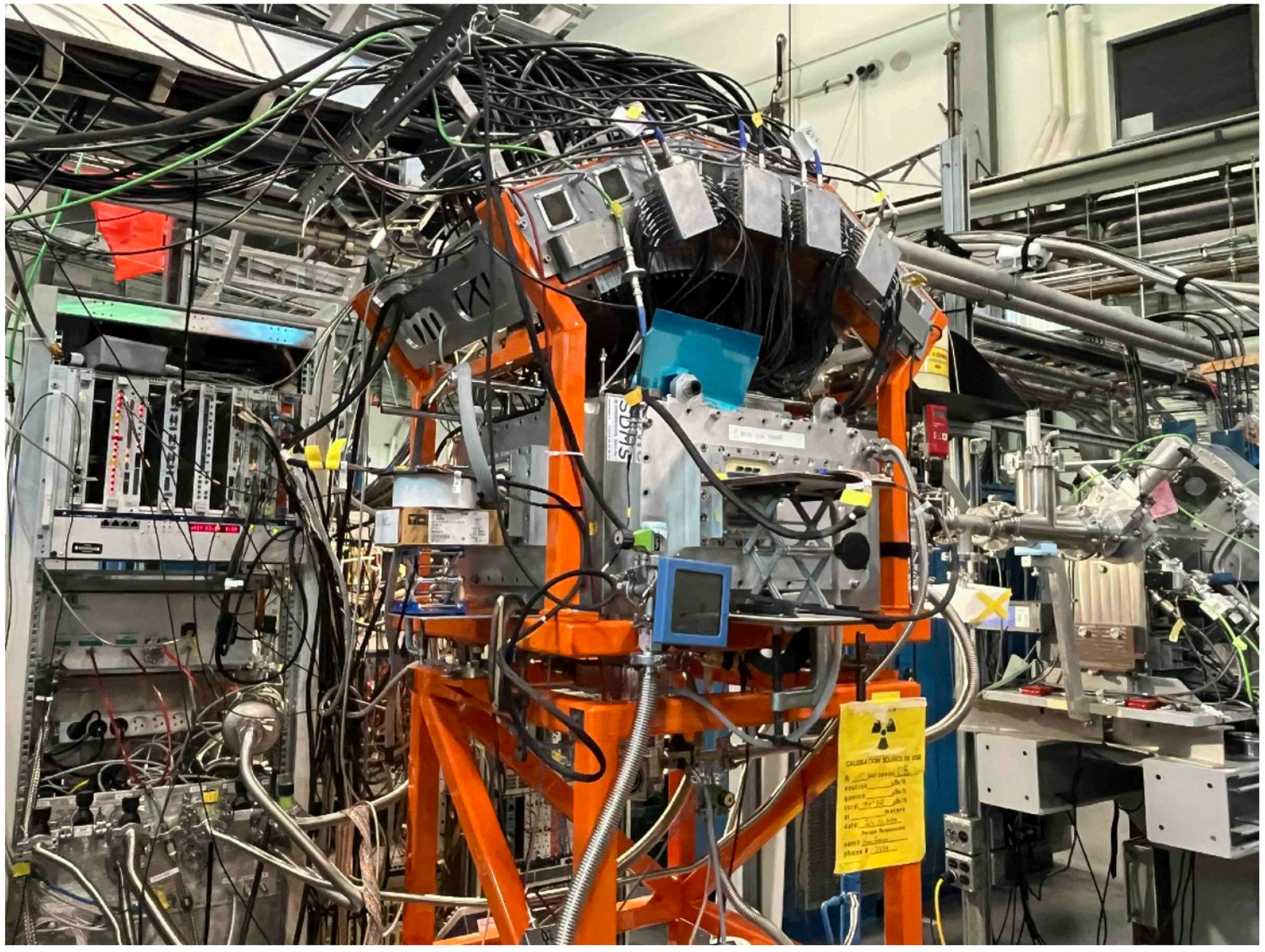
Triple coincidence γ-ray ^{96}Zr



Department News - Nuclear Physics

CNRS - TRIUMF IRL

ACTAR Active Target from GANIL in France at TRIUMF @ ISACII



- Spectroscopy of ^{12}Li

  Spokespersons : W.N. Catford, B. Fernandez-Dominguez & T. Roger

  July

- Resonant elastic scattering on ^{17}F

  Spokespersons : G.F. Grinyer & T. Roger

  August

- Single particle states in ^{21}Al

  Spokespersons : B. Fernandez-Dominguez, T. Roger, O. Tengblad

  October

GANIL (France)
University of Regina (Canada)
University of Santigao de Compostela (Spain)
University of Surrey (UK)

Department News - CMMS

Chemistry and Physics of Lipids 270 (2025) 105496

Contents lists available at ScienceDirect

Chemistry and Physics of Lipids

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

Research paper

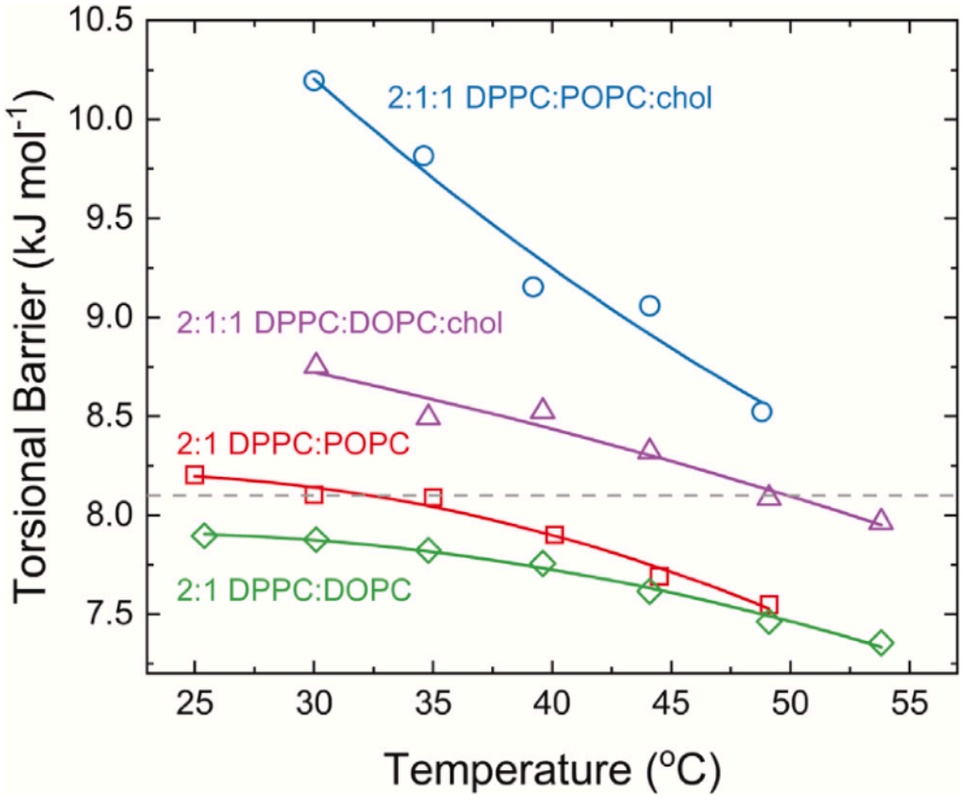
Nanoscale dynamics in model phospholipid biomembranes probed by muon spin resonance spectroscopy: The effects of membrane composition and temperature on acyl chain and cholesterol motion

Iain McKenzie [a,b,c,*], Mitchell DiPasquale [d,1], Maksymilian Dziura [d], Thomas Gutberlet [e], Nathan A. Hartwig [a,c], Victoria L. Karner [a], Robert Scheuermann [f], Drew Marquardt [d,**]

First investigation using μSR to study biomembrane nanoscale dynamics

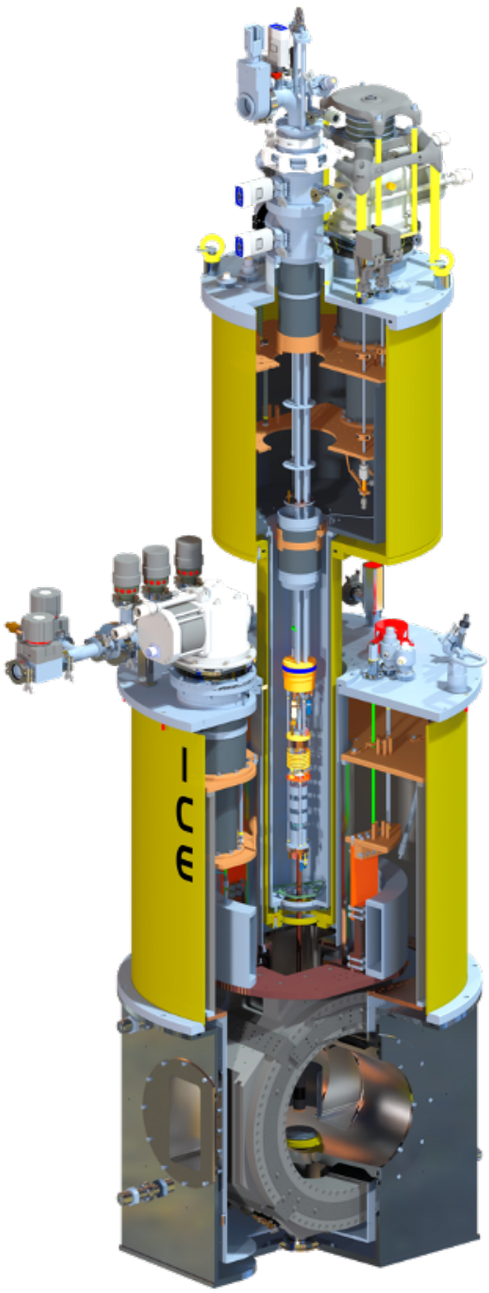
Investigating controversy about whether cholesterol stiffens biomembranes containing unsaturated phospholipids.

Observation :
The presence of cholesterol significantly stiffens the acyl chains in lipid mixtures.



Department News - CMMS

New M9H Experimental End-station Sample Environment



The new M9H magnet, cryostat and dilution fridge (DR).

The complexity of this system is what has caused many unanticipated difficulties for the vendor in delivering it on time … and substantially why CFI granted the further extension.

Note that this system is substantially cryogen-free to help the CMMS program manage the limitations of the Meson Hall liquefier system.

- **CFI extends deadline of project to May 2026**, allowing ICE Oxford to deliver an experimental magnet that meets specifications without significant financial complications to the project.

- Feedback from CFI indicated that the TRIUMF commitment to complete the control system so that it could deliver beam and become operational in 2025 was critical in coming to the above outcome. **Great decision from TRIUMF.**

Department News - Scientific Computing

Recent ML publications with groups around the lab!

- CaloQVAE:
  - Npj Quantum Information “Conditioned quantum-assisted deep generative surrogate for calorimeter interactions” published in ‘Quantum Enhanced Machine Learning’ collection
  - Perimeter+TRIUMF+NRC+D-Wave story here
- ALPHA-g: annihilation vertex z-reconstruction JHEP accepted
- Accelerator: JINST accepted on Model Coupled Accelerator Tuning (MCAT) + Bayesian Optimisation for Ion Steering (BOIS)
  - Planning for ‘production’ deployment

Subatomic Physics Long Range Plan

LRP FOR 2027 – 2034, WITH OUTLOOK TO 2041

- LRPC Mandate:
- The Committee is asked to identify subatomic physics scientific ventures and ***priorities*** that should be pursued by the community on a 7 – 14-year horizon and that would ensure Canadian global scientific leadership, considering:
    i. the optimization of the human and financial resources of the Canadian subatomic physics community in terms of research excellence and impact
    ii. the alignment of research endeavors with the established expertise and strengths of the Canadian community
    iii. the need to coordinate large projects and collaborations with Canada's international partners in a manner that maximizes scientific excellence and impact
    iv. the concurrent requirement to maintain and further develop world-class domestic research programs and infrastructure

The establishment of priorities will be discussed in more detail at the CINP and IPP Town Hall meetings

- Budgetary estimates, both for new capital investments and for operations, must be provided, including funding ranges for prioritized endeavours.
    - These ranges should include funding levels that would allow for a restrained, yet efficient, contribution to the ventures, as well as levels that would enable a more extensive contribution.

Courtesy : P.E. Garrett

Subatomic Physics Long Range Plan

LPRC MEMBERSHIP – VOTING MEMBERS

Paul Garrett (Co-Chair)	University of Guelph	Exp. Nuclear Physics
Alison Lister (Co-Chair)	University of British Columbia	Exp. Particle Physics
Torben Ferber	KIT, Germany	Exp. Particle Physics
Alfredo Galindo-Uribarri	ORNL, USA	Exp. Nuclear Physics
Darren Grant	Simon Fraser University	Exp. Astroparticle Physics
David Hornidge	Mount Allison University	Exp. Hadronic Physics
Katelin Schutz	McGill University	Theo. Astroparticle Physics
Hirohisa Tanaka	Standford University, USA	Exp. Neutrino Physics
Nicole Vassh	TRIUMF	Theo. Nuclear Physics
Simon Viel	Carleton University	Exp. Neutrino/DM Physics

LPRC membership selected for their expertise and broad view, and will not promote their own research interests

Courtesy : P.E. Garrett

LPRC MEMBERSHIP – NON-VOTING MEMBERS

Carsten Krauss	**IPP Director**
Garth Huber	**CINP Executive Director**
Kevin Lapointe	**NSERC Manager**
Oliver Gagnon	**CFI Associate Director**
Preliminary - to be updated	**Co-Chairs 2026 SAP-ES**
	TRIUMF Representative
	SNOLAB Director
	MacDonald Institute Director
	Perimeter Institute representative

Courtesy : P.E. Garrett

LRPC TERMS OF REFERENCE

- Process and Timeline:
- The LRP process will be driven by the Canadian subatomic physics community
- Organized by CINP+IPP, with funding provided by NSERC via SAP-MRS program
- CINP and IPP are tasked to prepare briefs for the LRPC
  - These briefs must summarize the scientific vision and priorities put forward by the sub-communities they represent and serve, including both experimental and theoretical facets
  - Overall recommendations may also be included in the briefs
- The briefs are to be submitted to LRPC no later than November 30, 2025
- Eventual responses to the briefs by individuals or organizations would be accepted.
- Throughout the process, the LRPC may also solicit additional input from various sources, as it sees fit.
- The LRPC will hold public consultations after receiving the briefs
- The LRPC will submit its final report by September 30, 2026

Courtesy : P.E. Garrett

Any other business

TRIUMF

Thank you
Merci

www.triumf.ca

Follow us **@TRIUMFLab**