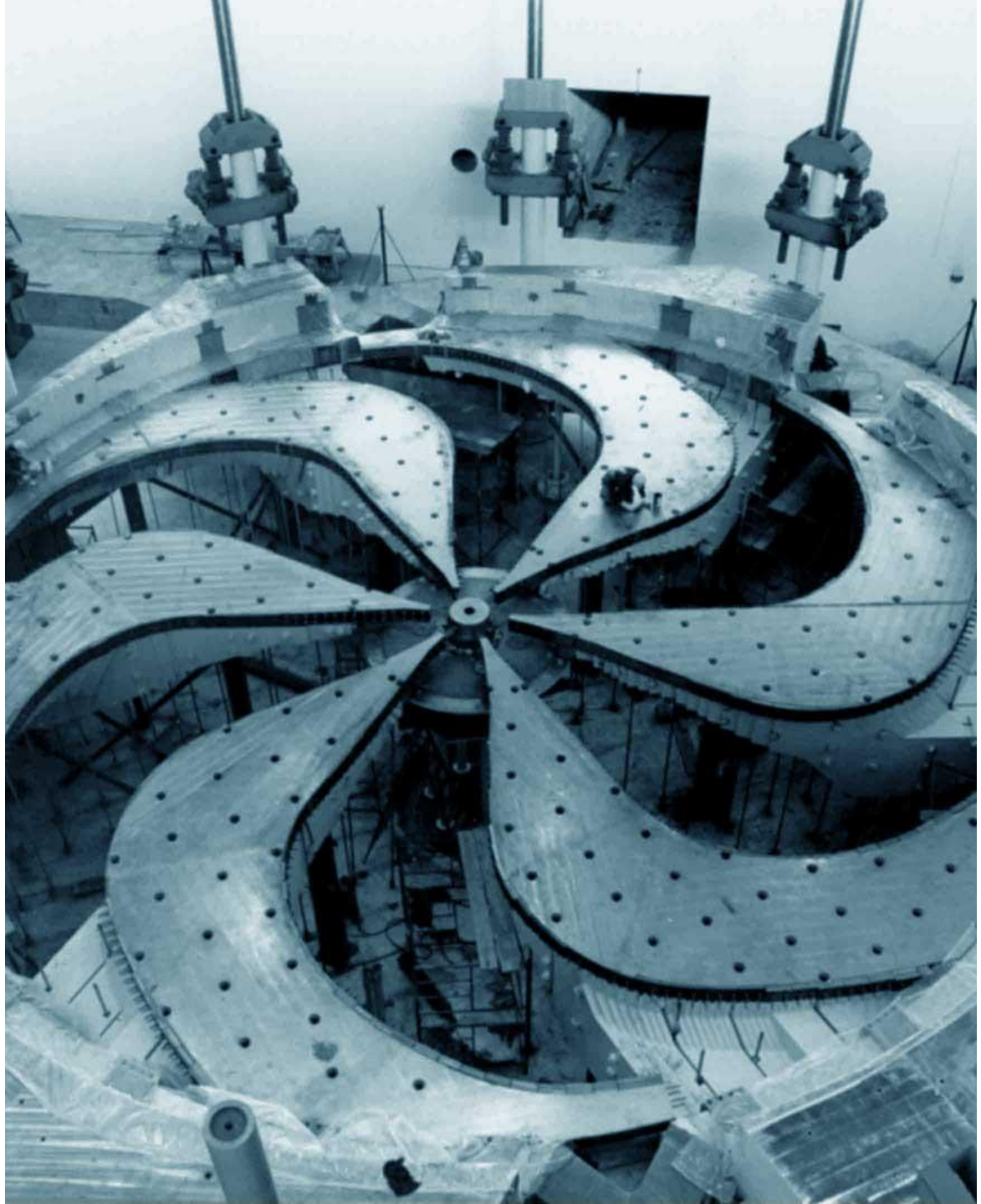
PSD Mixer

4 November 2022

Petr Navratil



Agenda

- Division updates
- Q+A
- IAMI Update by Esther Schirrmacher
- Science Talk

  John Behr: “Fun Sym with Atom Traps”
- Pumpkin pie and hang-out time!
- IAMI tour (for those who signed up)

We are now keeping a record for in-person mixer attendees as required by Finance, and to help the Mixer Committee plan our mixers accordingly. Please **scan the QR code** at the door or on the presentation slides to sign-in. Online attendees do not have to sign in.

Divisional News

- ACOT - October 24-26
  - PSD organized parallel sessions went well
  - 14 PSD presenters in the poster session
  - Participation in the tour

Served as PRC dry runs

  - Among ACOT recommendations:
    - Improve communications between leadership and users, students, postdocs, staff

    Means of communication
    - Town Halls
    - Mixers
    - Site-wide emails
    - Newsletters
    - Senior Management Meeting slides available weekly on Docushare
    - Meetings with leadership – GAPS event on Tuesday, Nov 1

Divisional News

- NSERC grant applications submission deadline passed
  - Seven SAP grant proposals led by PSD BAEs
  - One RTI lead by PSD BAE

- Canadian Nuclear Physics for Astrophysics Network (CaNPAN) annual meeting on Oct 31 – Nov 1
  - Talk on TRIUMF storage ring plans by Iris Dillmann and Rene Reifart

- Formal Remote Work agreements – 11 from PSD submitted to HR

- Experimental space requests by HAICU & RadMol (Laser Lab) approved by the Leadership Team
  - HAICU in the Proton Hall Extension
  - RadMol Laser Lab in the old ATLAS Tier 1 Centre

Divisional News

- Outreach activities
  - Kate Pachal and Stan Yen have re-started the Saturday Morning Lectures
- BAE search – ALPHA
  - Ongoing
- Director, Physical Sciences search
  - Search committee formed

Announcements

- NRC Evaluation – Peer Review Committee (November 29 – December 3, 2022)
  - Plenary talk dry runs on Thursday Oct 27
  - Research background information and science highlights and researchers CVs submitted
  - Preparations for the parallel sessions, poster session, tour ongoing

Peer Review Committee Members
Dr. Souzan Armstrong (Commerc)
Dr. Kimberly S. Budil, Chair
Dr. Simon R. Cherry (LS)
Dr. Alexandra Gade (NP)
Dr. Michel Gingras (MS)
Dr. Brad Sherrill (NP, ACC)
Dr. Elizabeth H. Simmons (PP)
Dr. Frank Zimmermann (ACC)

November 30th

Time	Event		
11:30 – 13:00	Parallel Sessions Detailed presentations and discussion of past performance and future plans:		
	Particle Physics **Room: Theory Room**	Nuclear Physics **Room: Auditorium**	Materials Science **Room: MOB Boardroom**
	Accelerators **Room: ISAC II Conference Room**	Life Sciences **Room: MOB Conference Room**	TRIUMF Commercialization / TRIUMF Innovations ***CLOSED SESSION***

November 29th

Plenary	Plenary Lead	Question 1: To what extent is TRIUMF a platform for scientific excellence? (knowledge creation, connecting role, infrastructure)	Question 2: Is TRIUMF focusing on the right areas to stay relevant to serve the needs of the TRIUMF community and beyond?	Question 3: To what extent does TRIUMF have the capacities, competencies, and facilities needed to achieve its objectives moving forward?	Question 4: To what extent is the governance of TRIUMF effective/efficient? Are there efficiencies to be gained?
Introduction	Kate Pachal	✓	✓	✓	
Overview	Nigel Smith	✓	✓	✓	✓
Particle Physics*	Isabel Trigger	✓	✓	✓	
Nuclear Physics*	Chris Ruiz	✓	✓	✓	
Accelerators*	Thomas Planche	✓	✓	✓	
Life Sciences*	Conny Hoehr	✓	✓	✓	
Materials Sciences*	Iain McKenzie	✓	✓	✓	
TRIUMF Innovations & Industrial Partnerships*	Kathryn Hayashi	✓	✓	✓	✓
Strategic Planning	Sean Lee	✓	✓	✓	✓
Governance & Management	Nigel + BoG representative	✓	✓	✓	✓

Announcements

- TRIUMF NP-EEC meeting will be held in person on January 30th and 31st, 2023
  - Experiment numbers must be requested by 16:00 PST Wednesday, December 7th
  - The deadline for submission of the Proposals, Progress Reports, Letters of Intent, is Friday, December 9th at 23:59 PST

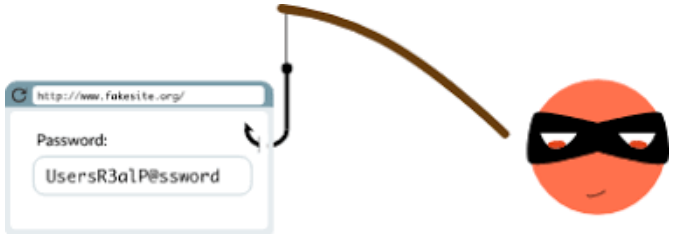
- TRIUMF MMS-EEC meeting will take place in person on Monday and Tuesday, January 23rd and 24th, 2023
  - The deadline for requesting a new experiment number is Friday, December 2, 2022, at 16:00 PST
  - The deadline for submission of new and continuing proposals is Wednesday, December 7, 2022, at 23:59 PST

Announcements

- Free coffee in the cafeteria!

Reminders

- It is important to **enter your time in Workday** accurately and in a timely manner
  - Relevant for project tracking
- Change your passwords and make them more secure
- Do not fall for phishing attacks!



TUCAN source update Fall 2022

TUCAN
TRIUMF Ultra Cold Advanced Neutron source

TRIUMF

1 tail section wall 1 leak checking complete
(R. Matsumiya, S. Stargardter)

- needs to be superfluid helium tight
- leak rate < 1e-11 mbar l/s ! Good to go!

2 Large storage tanks for deuterium and isopure helium (C. Gibson)

- 2 tanks, 18 m^3 each
- long dispute with vendor (Petro Engineering) about scope and prize involving lawyers
- resolved after last ultimatum dangling legal action.
- delivered!

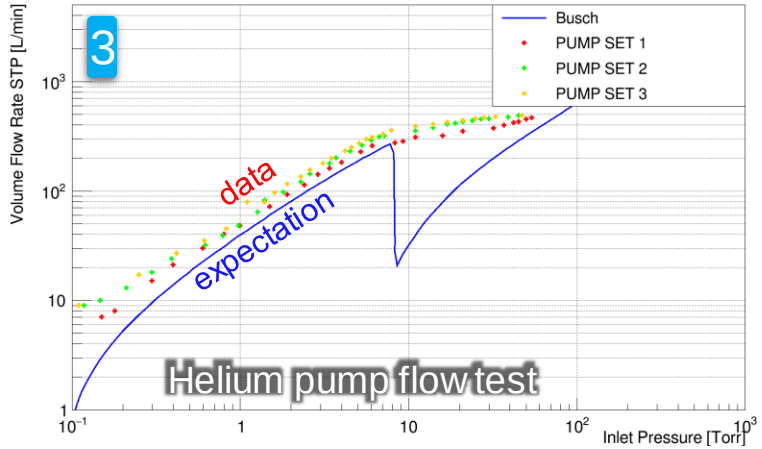
3 Large **helium pump** tests (A. Brossard)

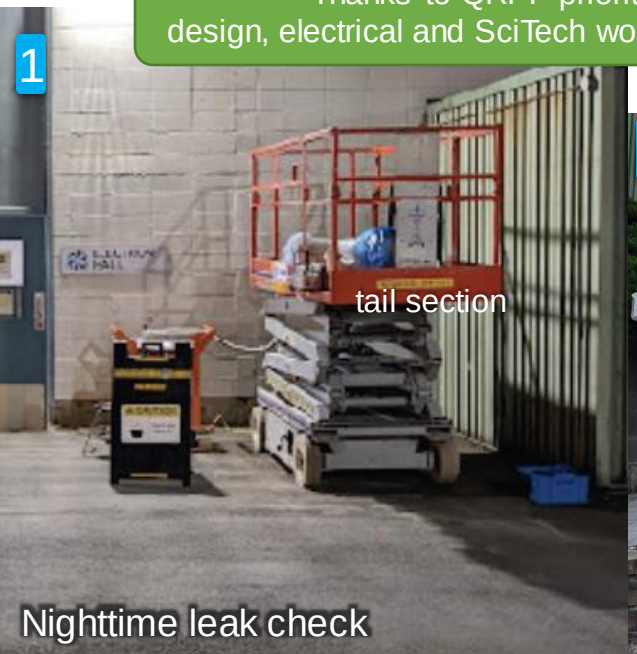
- VFDs and pump operation via PLC work well
- Revised test setup proves pumps work better than specified (blue line)

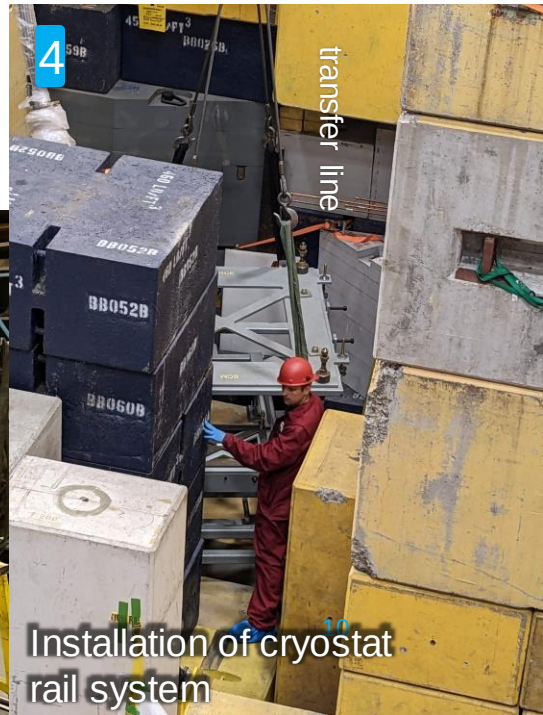
4

- **Construction / installation progress**
  - cryo-connection box ready for leak checking
  - tail section wall 1 instrumentation in progress
  - cryostat rail system installed inside shielding
- **Design progress**
  - LD2 cryostat drawings at 99%
  - Lower D2O vessel drawings at 90%, upper at 80%
  - He pumping tubes at 70%
  - Graphite carrier mod, D2O lifting device, cryo box internals detailing starting

Thanks to QRPP priority boost
design, electrical and SciTech work is accelerating!

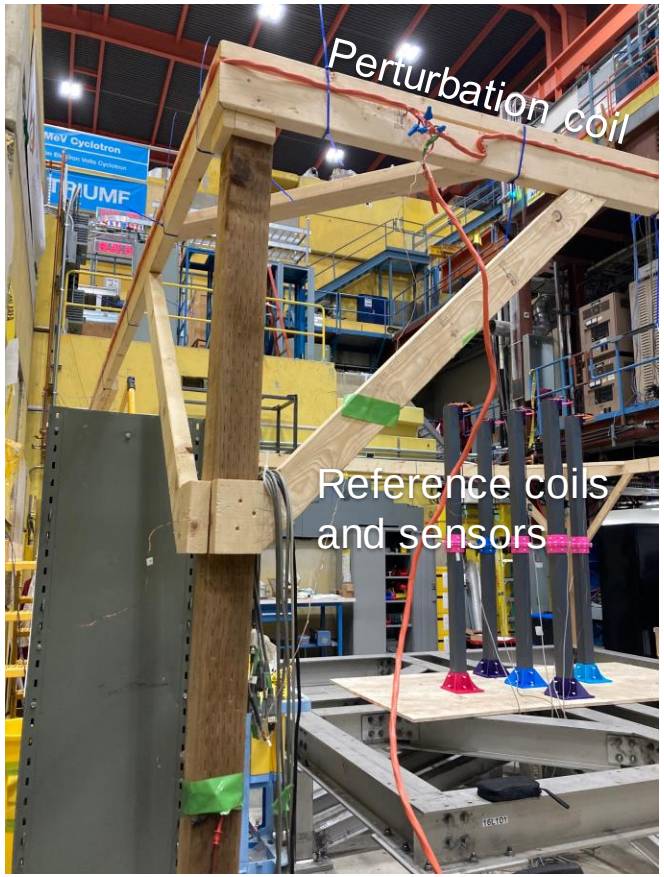






TUCAN update Fall 2022 – nEDM

MSR shielding factor test
Setup: perturbation coil and sensor setup



- UK company Magnetic Shields Limited (MSL): arrived on-site October 3rd for 10-12 months, assembly & installation of TUCAN nEDM magnetically shielded room (MSR) in meson hall B2 level;
  onboarding successful, work has begun

- Measurements with large perturbation coil, small reference coils, and sensors;
  will be used to confirm shielding factor of TUCAN MSR
  'empty' calibration measurements w/o MSR completed, two data sets with main cyclotron ON and OFF

Research highlights - Nuclear Physics

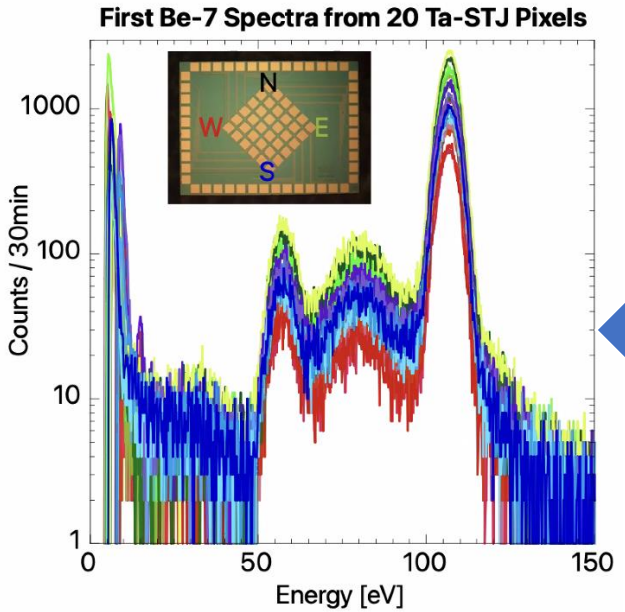
- **DRAGON ^{7}Be(α,γ)^{11}C Publications**:
  - A. Psaltis, A. A. Chen, R. Longland, **D. S. Connolly**, C. R. Brune, **B. Davids, J. Fallis**, R. Giri, U. Greife, **D. A. Hutcheon**, L. Kroll,**A. Lennarz**, J. Liang, M. Lovely, M. Luo, C. Marshall, S. N. Paneru,A. Parikh, **C. Ruiz**, A. C. Shotter, and **M. Williams**. First inverse kinematics measurement of resonances in 7Be(α, γ)11C relevant to neutrino-driven wind nucleosynthesis using dragon. Phys. Rev. C, 106:045805, Oct 2022.
  - A. Psaltis, A. A. Chen, R. Longland, **D. S. Connolly**, C. R. Brune, **B. Davids**, **J. Fallis**, R. Giri, U. Greife, **D. A. Hutcheon**, L. Kroll, **A. Lennarz**, J. Liang, M. Lovely, M. Luo, C. Marshall, S. N. Paneru, A. Parikh, **C. Ruiz**, A. C. Shotter, and **M. Williams**. Direct measurement of resonances in 7Be(α, γ)11C relevant to vp-process nucleosynthesis. Phys. Rev. Lett., 129:162701, Oct 2022.
- **TUDA ^{12}Be experiment, Hungarian & Catania groups – looking at how the structure of ^{12}Be can be explained as clusters of lighter nuclei:**
  - Nikola Vukman, Neven Soi´c, Martin Freer, **Martin Alcorta, Devin Connolly**, Petra ˇColovi´c, Thomas Davinson, Alessia Di Pietro, **Annika Lennarz**, Athanasios Psaltis, **Chris Ruiz**, Milivoj Uroi´c, and **Matthew Williams**. Cluster decays of 12be excited states. Frontiers in Physics, 10, 2022.
- **^{23}Ne(*d*,*p*γ)^{24}Ne at TIGRESS to study states in ^{24}Ne relevant to astrophysical x-ray bursts:**
  - *G*. Lotay, J. Henderson, W. N. Catford, F. A. Ali, J. Berean, **N. Bernier, S. S. Bhattacharjee**, M. Bowry, **R. Caballero-Folch, B. Davids**, T. E. Drake, **A. B. Garnsworthy**, F. Ghazi Moradi, **S. A. Gillespie, B. Greaves, G. Hackman**, S. Hallam, D. Hymers, E. Kasanda, D. Levy, B. K. Luna, A. Mathews, Z. Meisel, **M. Moukaddam, D. Muecher, B. Olaizola**, N. A. Orr, H. P. Patel, M. M. Rajabali, **Y. Saito, J. Smallcombe**, M. Spencer, C. E. Svensson, K. Whitmore, and **M. Williams**. Single neutron transfer on 23Ne and its relevance for the pathway of nucleosynthesis in astrophysical X-ray bursts. Physics Letters B, 833:137361, October 2022.
- **TITAN precision mass measurements of chromium, relating to *ab initio* theory calculations and shell structure around N=40:**
  - R. Silwal, C. Andreoiu, B. Ashrafkhani, J. Bergmann, **T. Brunner**, **J. Cardona**, K. Dietrich, **E. Dunling**, G. Gwinner, **Z. Hockenbery**, **J. D. Holt, C. Izzo, A. Jacobs**, A. Javaji, **B. Kootte**, Y. Lan, D. Lunney, **E. M. Lykiardopoulou**, T. Miyagi, M. Mougeot**, I. Mukul**, T. Murb¨ock, W. S. Porter, M. Reiter, **J. Ringuette**, **J. Dilling, and A. A. Kwiatkowski**. Summit of the N=40 island of inversion: Precision mass measurements and ab initio calculations of neutron-rich chromium isotopes. Physics Letters B, 833:137288, October 2022.
- **Doppler-cooling Technique paper (CERN) with attending TITAN personnel:**
  - S. Sels, F. M. Maier, M. Au, P. Fischer, C. Kanitz, V. Lagaki, S. Lechner, E. Leistenschneider, D. Leimbach, **E. M. Lykiardopoulou, A. A Kwiatkowski**, T. Manovitz, Y. N. Vila Gracia, G. Neyens, P. Plattner, S. Rothe, L. Schweikhard, M. Vilen, R. N. Wolf, and S. Malbrunot-Ettenauer. Doppler and sympathetic cooling for the investigation of short-lived radioactive ions. Physical Review Research, 4(3):033229, September 2022.

Latest ^{7}Be implantation for the BeEST Sterile Neutrino Experiment – September 2022

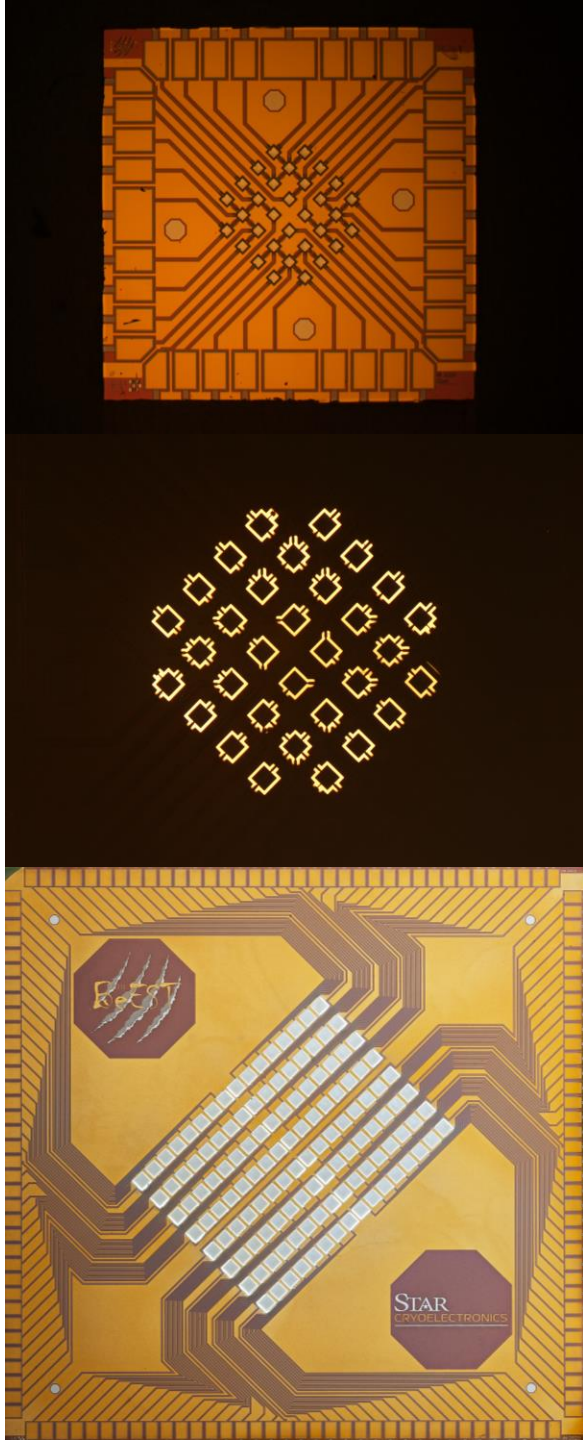
- Beam produced using IG-LIS ion source to reduce ^{7}Li contamination – a major source of detector background (via distorting local lattice) and degradation in resolution

- IG-LIS was successful in suppressing Li by a factor of 4,000!! (well done to Jens Lassen and team for their installation of IG-LIS on ISAC West target station for the first time)
  - Li/Be ratio was 1:7

- Implanted Tantalum Superconducting Tunnel Junction (STJ) for 24 hours



First Light (1 hour) from New STJ, now counting at Livermore!! (S. Friedrich)



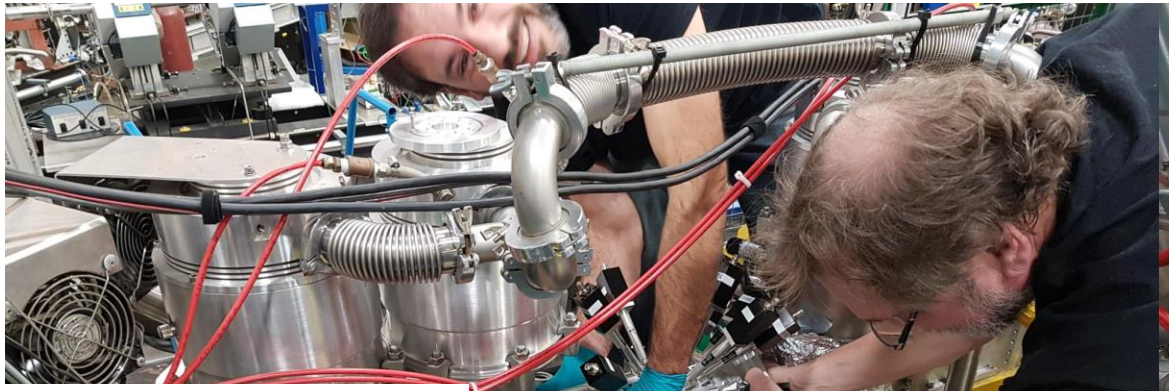
Various STJ designs used in the BeEST so far, courtesy S. Friedrich, LLNL

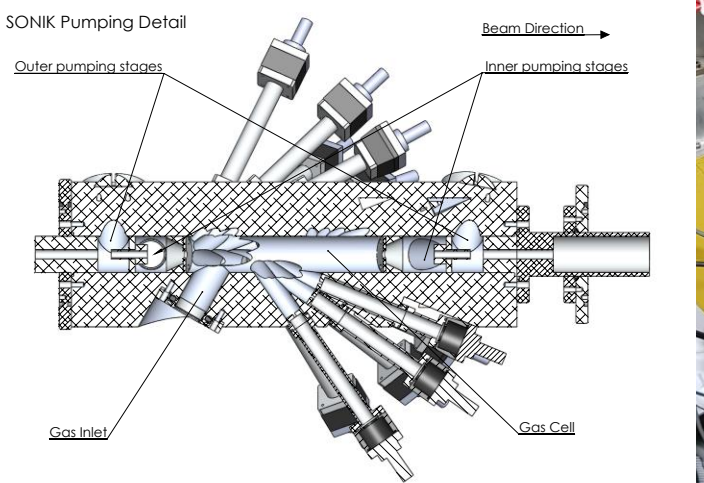
SONIK (Scattering of Nuclei in Inverse Kinematics) Chamber being fitted onto DRAGON gas target

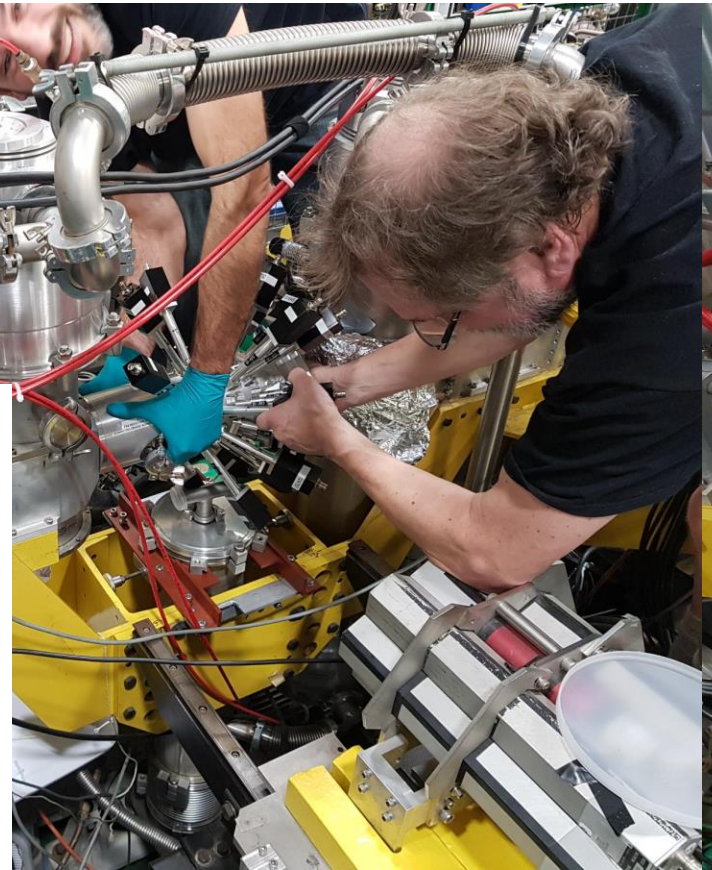
2x ^{7}Be experiments starting next week:

- ^{7}Be(α,α)^{7}Be [University of Notre Dame led] – for astrophysics and National Ignition Facility calibration reaction]
- ^{7}Be(*p*,*p*)^{7}Be [TRIUMF-Colorado School of Mines-Ohio led] – for astrophysics, and *ab initio* NCSMC comparison

Will be delivered 100% pure ^{7}Be beam, 1 x 10^{8} s^{-1}, from graphite target and laser ion source







Research highlights - Theory

- Particle theory – review paper in Physics Reports; PRR, PRD papers
- Nuclear astrophysics – 2 papers submitted (Science, Frontiers)
- *Ab initio* nuclear theory support for a laser spectroscopy NSCL experiment & a GSI experiment
- Conference proceedings: MEDEX'22, New Scientific Opportunities with ARIEL e-linac

Physics Reports 961 (2022) 1–35

Contents lists available at ScienceDirect

Physics Reports

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

Cosmological constraints on dark matter interactions with ordinary matter

Manuel A. Buen-Abad [a,b,*], Rouven Essig [c], David McKeen [d], Yi-Ming Zhong [e]

PHYSICAL REVIEW RESEARCH **4**, 023106 (2022)

Lorentz violation in Dirac and Weyl semimetals

V. Alan Kostelecký [1,2] Ralf Lehnert [1,2] Navin McGinnis [3,4,1] Marco Schreck [5] and Babak Seradjeh [1,2,6]

PHYSICAL REVIEW D **106,** 035011 (2022)

Accelerating Earth-bound dark matter

David McKeen,[1,*] Marianne Moore,[1,2,3,†] David E. Morrissey,[1,‡] Maxim Pospelov,[4,5,§] and Harikrishnan Ramani[6,‖]

Title: Observational signatures of transuranic fission fragments in stars

Authors: Ian U. Roederer[1,2]*, Nicole Vassh[3], Erika M. Holmbeck[4,5,2], Matthew R. Mumpower[6,7,2], Rebecca Surman[8,2], John J. Cowan[9], Timothy C. Beers[8,2], Rana Ezzeddine[10,2], Anna Frebel[11,2], Terese T. Hansen[12],Vinicius M. Placco[13], Charli M. Sakari[14]

PHYSICAL REVIEW LETTERS **129,** 132501 (2022)

Charge Radii of ^{55,56}Ni Reveal a Surprisingly Similar Behavior at $N = 28$ in Ca and Ni Isotopes

Felix Sommer,[1,*] Kristian König,[2] Dominic M. Rossi,[1,3] Nathan Everett,[2,4] David Garand,[2] Ruben P. de Groote,[5] Jason D. Holt,[6,7] Phillip Imgram,[1] Anthony Incorvati,[2,4] Colton Kalman,[2,8] Andrew Klose,[9] Jeremy Lantis,[2,8] Yuan Liu,[10] Andrew J. Miller,[2,4] Kei Minamisono,[2,4,†] Takayuki Miyagi,[1,11,6] Witold Nazarewicz,[12,4] Wilfried Nörtershäuser,[1,13,‡] Skyy V. Pineda,[2,8] Robert Powel,[2,4] Paul-Gerhard Reinhard,[14] Laura Renth,[1] Elisa Romero-Romero,[10,15] Robert Roth,[1,13] Achim Schwenk,[1,11,16] Chandana Sumithrarachchi,[2] and Andrea Teigelhöfer[6]

Solar Data Uncertainty Impacts on MCMC Methods for r-process Nucleosynthesis

Nicole Vassh,[1,*] Gail C. McLaughlin,[2] Matthew R. Mumpower,[3,4] and Rebecca Surman[5]

PHYSICAL REVIEW LETTERS **129,** 142502 (2022)

Proton Distribution Radii of $^{16-24}$O: Signatures of New Shell Closures and Neutron Skin

S. Kaur,[1,2] R. Kanungo,[1,3,*] W. Horiuchi,[4,5,6] G. Hagen,[7,8,3] J. D. Holt,[3] B. S. Hu,[3] T. Miyagi,[9,10] T. Suzuki,[11] F. Ameil,[12] J. Atkinson,[1] Y. Ayyad,[13] S. Bagchi,[1,12] D. Cortina-Gil,[13] I. Dillmann,[12,14] A. Estradé,[1,12] A. Evdokimov,[12] F. Farinon,[12] H. Geissel,[12,14] G. Guastalla,[12] R. Janik,[15,†] R. Knöbel,[12] J. Kurcewicz,[12] Yu. A. Litvinov,[12] M. Marta,[12] M. Mostazo,[13] I. Mukha,[12] C. Nociforo,[12] H. J. Ong,[16] T. Otsuka,[17,18] S. Pietri,[12] A. Prochazka,[12] C. Scheidenberger,[12,14] B. Sitar,[15] P. Strmen,[15,†] M. Takechi,[12] J. Tanaka,[16] I. Tanihata,[16,19] S. Terashima,[19] J. Vargas,[13] H. Weick,[12] and J. S. Winfield[12,†]

Constraining Neutrinoless Double-Beta Decay Matrix Elements from Ab Initio Nuclear Theory

A. Belley,[1,2,a)] T. Miyagi,[3,4] S. R. Stroberg,[5,b)] and J. D. Holt[1,6]

ARIEL experiments and theory

Petr Navrátil
TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia, V6T 2A3, Canada

PSD Holiday Hoorah

on December 9, 2022

To learn more about what is happening in PSD and around the lab,
check out Senior Management Meeting slides posted every Tuesday on DocuShare

Announcements

- Free coffee in the cafeteria!

Thank you
Merci

Questions?

Discovery, accelerated