TRIUMF

Canada's national laboratory
for particle and nuclear physics
and accelerator-based science

TRIUMF Report

CINP-IPP Joint Session

May 29, 2017

Jonathan Bagger
Director

CANADA 150
1867-2017

Bienvenue à l'Université de Sherbrooke!

Strategic Goals

1. Operate safely and effectively
2. Produce world class science
3. Connect TRIUMF to the world

1. Operate safely and effectively
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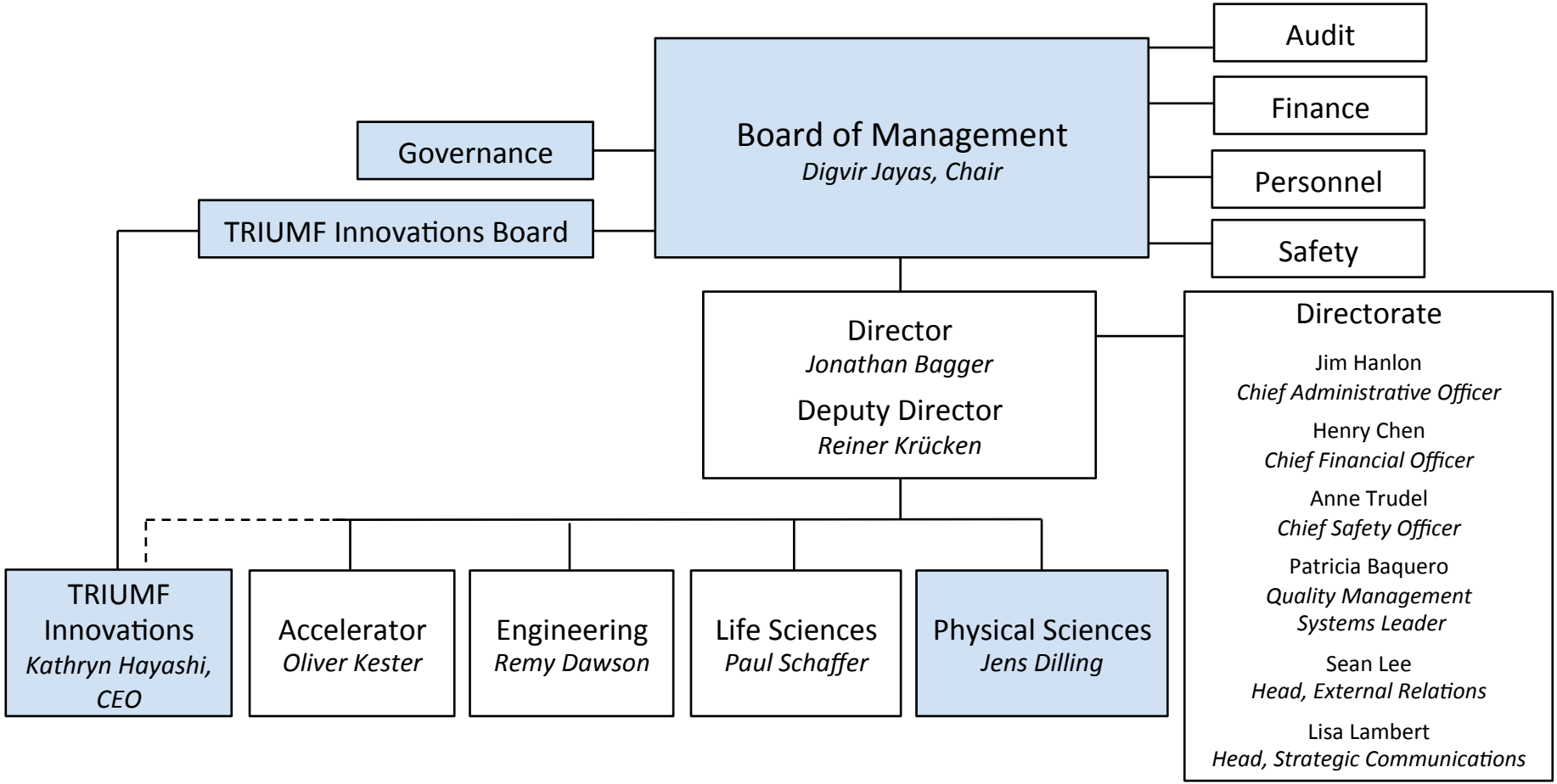
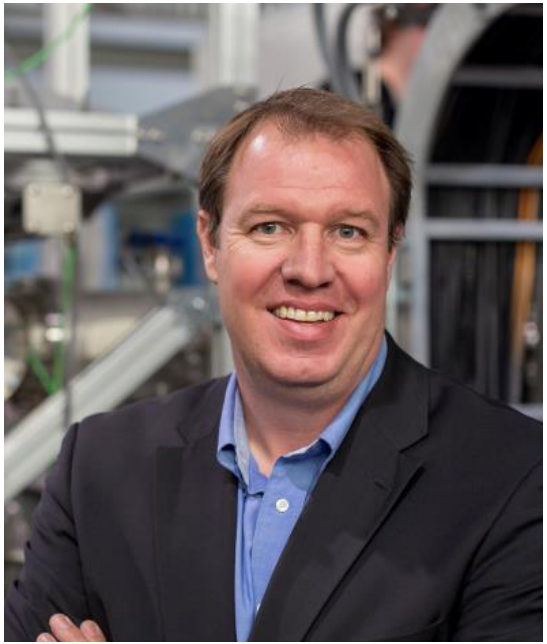
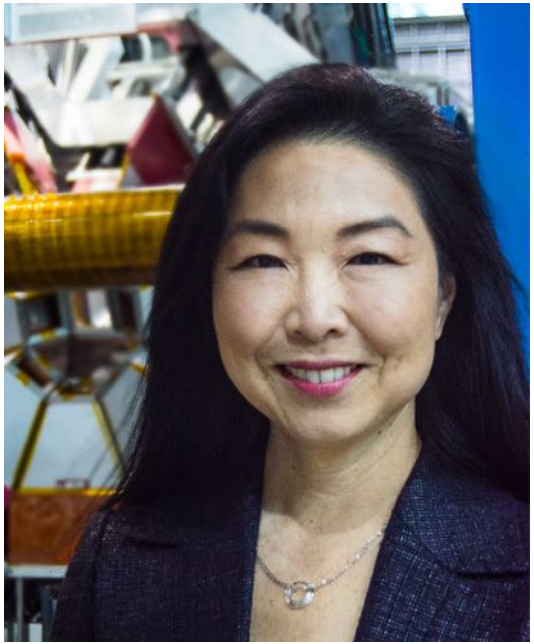
Operate Effectively – Organization



Operate Effectively – New Leadership



Jens Dilling
ALD, Physical Sciences



Kathryn Hayashi
CEO, TRIUMF Innovations

Operate Effectively – Staffing

- New BAEs
  - Alex Gottberg, Accelerator
    - Start date: November, 2016
    - Formerly postdoc at CERN, TRIUMF
    - PhD, Free University of Berlin
  - Monika Stachura, Life Sciences
    - Start date: October, 2016
    - Formerly postdoc at CERN, TRIUMF
    - PhD, University of Copenhagen

Operate Effectively – Staffing

- Otto Häuser Postdoctoral Fellow
  - Pietro Giampa, Physical Sciences
    - Start date: Summer, 2017
    - DEAP-3600 at SNOLAB
    - PhD, Queen's University

Operate Effectively – Staffing

- Queen's University
  - One joint position at Queen's, asymptotically at Queen's
  - One joint position at TRIUMF, asymptotically at TRIUMF
  - Initially in support of CPARC; Funded by CFREF
- University of British Columbia
  - One joint position at TRIUMF, asymptotically at TRIUMF
  - Initially in support of CMMS; Funded by CFREF

CPARC
Canadian Particle Astrophysics Research Centre

Stewart Blusson Quantum Matter Institute

CANADA FIRST RESEARCH EXCELLENCE FUND | APOGÉE CANADA FONDS D'EXCELLENCE EN RECHERCHE

Searches underway!

Operate Effectively – Staffing

- New Designation: Affiliate Scientist/Engineer
  - Recognizes select national and international scientists and research engineers who are making special contributions to TRIUMF
  - Replaces the Visiting Professor and Sabbatical Visitor designations
  - Apply through appropriate Associate Laboratory Director

Operate Effectively – Postdocs and Students

Graduate and Postdoc Society

Chair: Mike Bowry
Program Director: Jason Holt

February:	[Entrepreneurship Workshop]
April:	[Gender Bias Workshop]
	Hot Spots tour of Nordion and ATG
May:	[Effective Negotiations Workshop]
June:	Meet a Nobel Laureate – Art McDonald
	TRIUMF Junior Research Symposium
July:	GAPS BBQ
August:	Astronomy Night
September:	[NSERC Scholarship and Fellowship Information Session]
October:	Lectures by Rick Casten
	Three Minute Thesis Competition
November:	[Panic to Power Workshop]
December:	Faraday Show
January:	GAPS Annual Trivia Night
February:	WNPPC Symposium
	Hot Spots Tour

Also: Postdoc lecture series. Pub nights. Coffee meetups. [with IsoSIM]

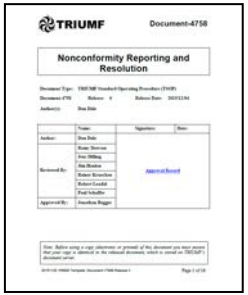
Operate Effectively – Processes and Procedures

Well defined processes are necessary for reliable operations

Revisions completed during FY 2016-2017:

TSOP-02	Nonconformities Reporting and Resolution
TSOP-08	Calibration and Inspection
TSOP-09	Quality Program Assessment
TSOP-12	Configuration Management
TSOP-15	Project Governance

TSOP-02



TSOP-08

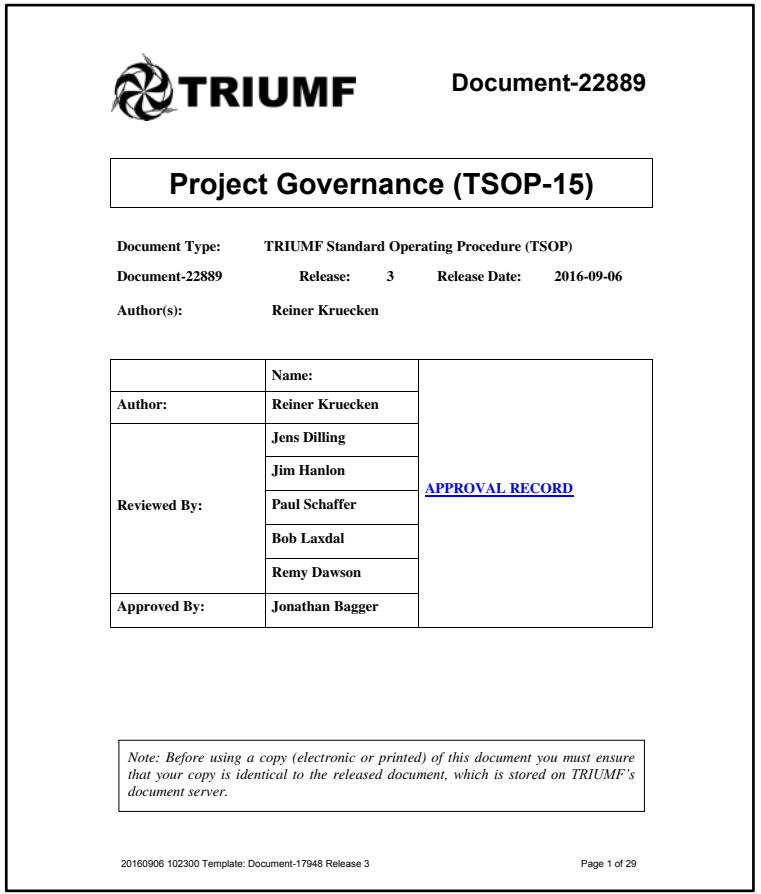
TSOP-09

TSOP-12

TSOP-15

Operate Effectively – Project Management

- Improvements to project management processes underway
  - Updated TSOP-15 on Project Governance
  - Upgraded Project Management Oversight Group



TRIUMF

Document-22889

Project Governance (TSOP-15)

Document Type: TRIUMF Standard Operating Procedure (TSOP)

Document-22889 **Release:** 3 **Release Date:** 2016-09-06

Author(s): Reiner Kruecken

	Name:	
Author:	**Reiner Kruecken**	
Reviewed By:	**Jens Dilling**	**APPROVAL RECORD**
	Jim Hanlon	
	Paul Schaffer	
	Bob Laxdal	
	Remy Dawson	
Approved By:	**Jonathan Bagger**	

Note: Before using a copy (electronic or printed) of this document you must ensure that your copy is identical to the released document, which is stored on TRIUMF's document server.

20160906 102300 Template: Document-17948 Release 3 Page 1 of 29

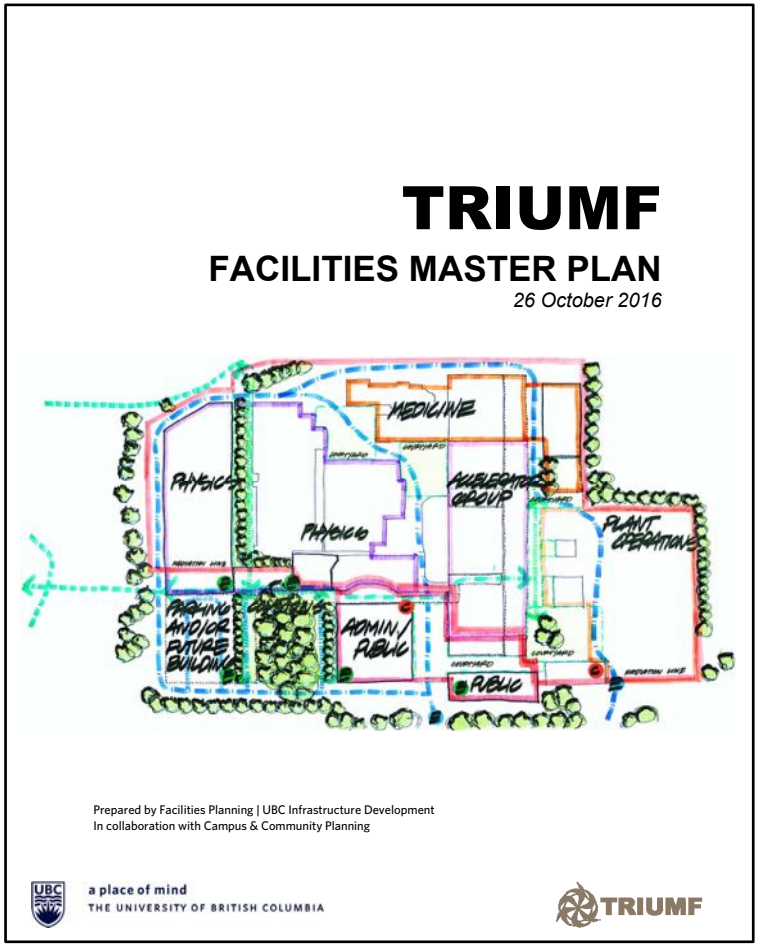
- Lots underway. Watch for changes!
  - Identity Management System
    - Single TRIUMF identity
    - Integrated access control
    - Enhanced security
    - Eduroam
  - New NCR Application
  - Office 365
  - VOIP
  - Agresso upgrade …

BCNET

Microsoft

Operate Effectively – Master Plan

- Master Plan complete
- Implementation underway!
- Phase 1:
  - Renovate Trailer GG for safety group and swing space
  - Renovate Trailer RR for ARIEL
  - Shrink MOB Library, convert into swing space
  - Consolidate MOB Detector Laboratory
- Phases 2 and 3 TBD
  - Office space….



Strategic Goals

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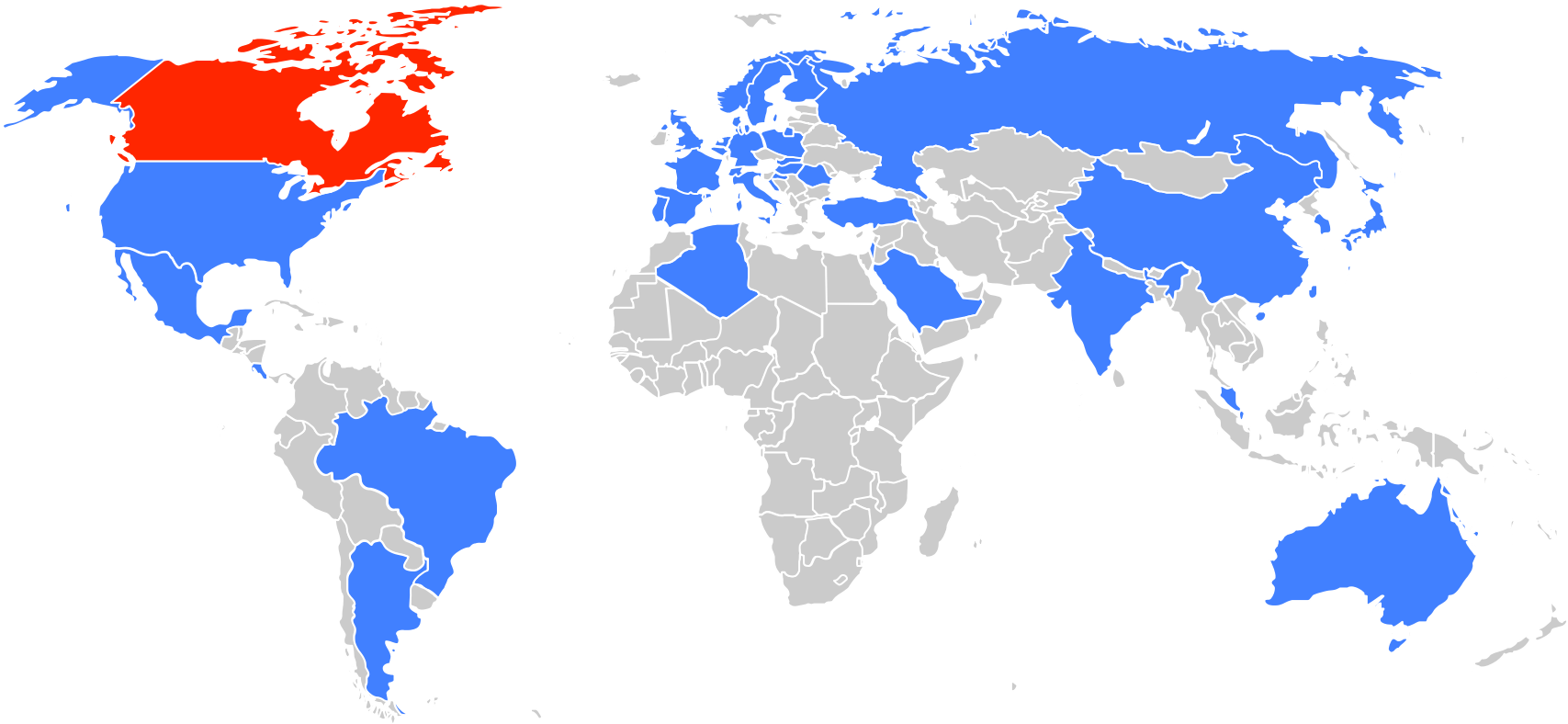
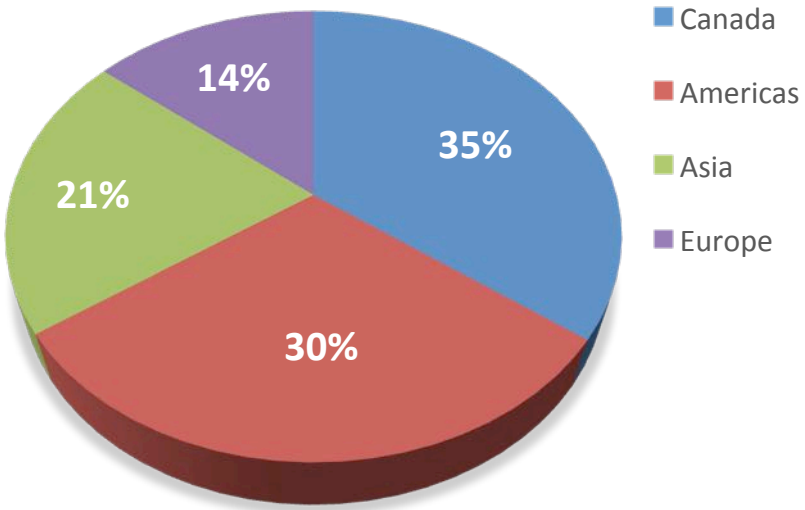
2. Produce world class science
3. Connect TRIUMF to the world

Produce World Class Science – TRIUMF Users

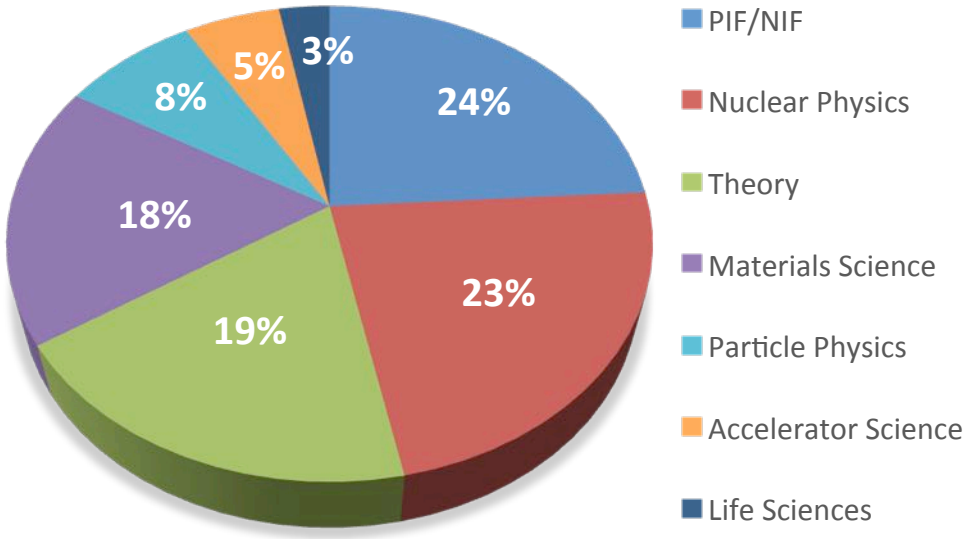


Produce World-Class Science – 2016

Scientific Visitors & Users by Region (645)



Scientific Visitors & Users by Field (645)

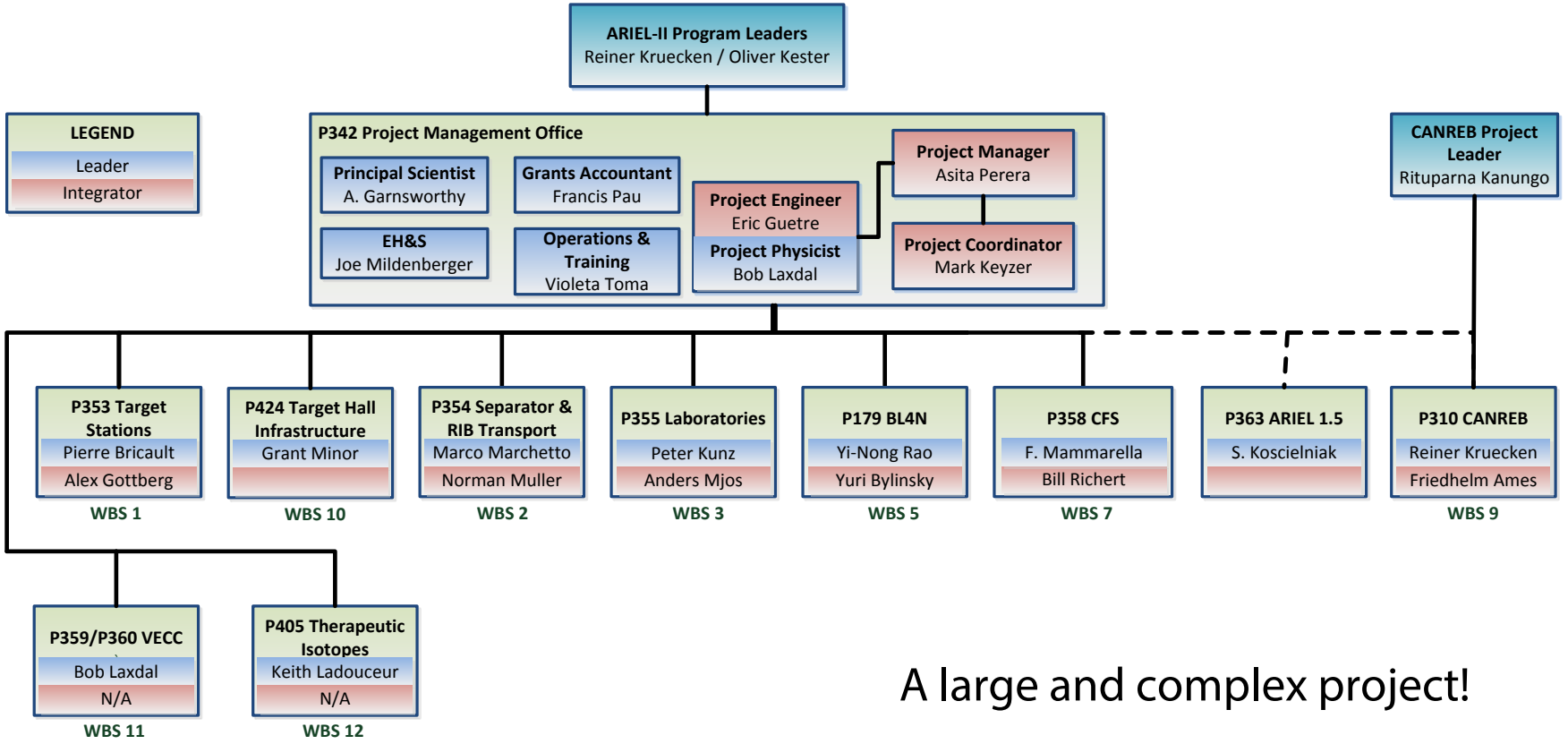


Produce World Class Science – ARIEL

- ARIEL
  - ~$100M project, supported by 19 universities, led by UVic
  - Second phase: ARIEL-II, $38M CFI project. Awarded $8.7M from the BC Knowledge Development Fund – the last piece of the puzzle!
  - Investment by five provinces: AB, BC, MB, ON, QC
  - CFI finalization is now under-way. Huge responsibility… For all of us!

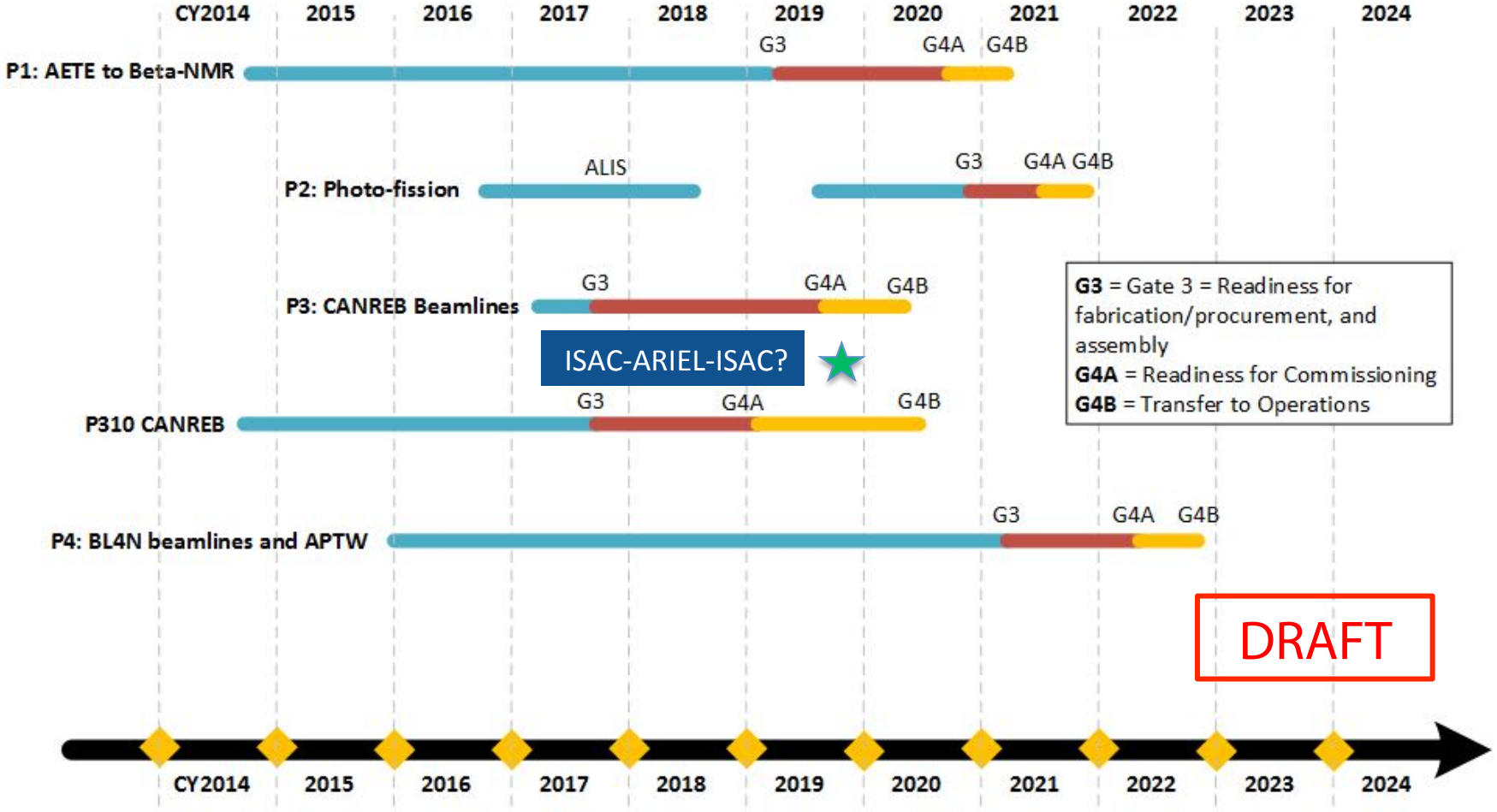
ARIEL is the future of TRIUMF

Produce World Class Science – ARIEL-II Organization



A large and complex project!

Produce World Class Science – ARIEL-II Implementation



Produce World Class Science – ARIEL-II Milestones

As presented during ARIEL Town Hall, January 10, 2017

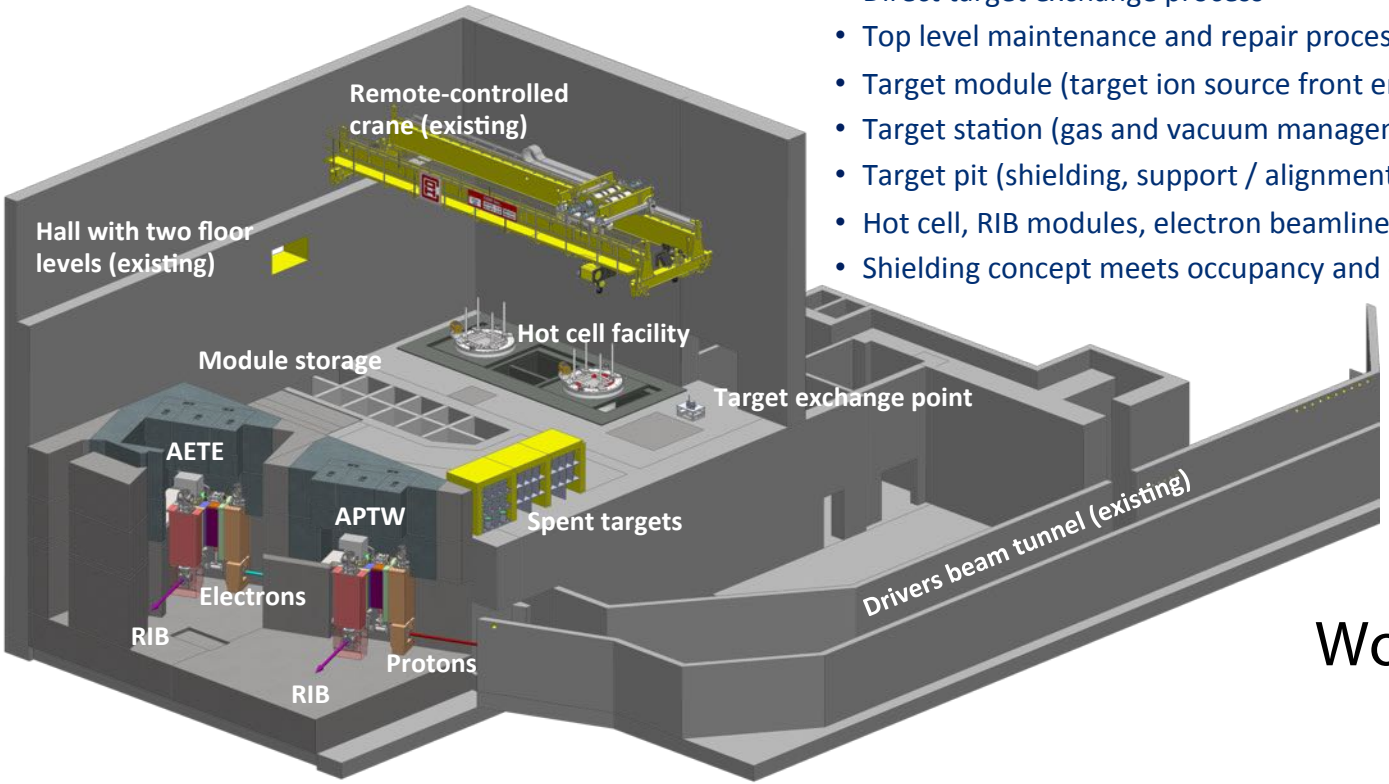
	Science Milestone	Month/Year
PHASE 3	First EEC approved experiments with high-mass accelerated beams from ISAC utilizing the CANREB/ARIEL EBIS charge breeder	10/2020 ★
PHASE 1	First EEC approved beta-NMR experiments with photo-produced ^{8}Li	03/2022
PHASE 2	First EEC approved experiments with photo-fission RIBs from the e-Linac	06/2022
PHASE 4	First EEC approved experiments with RIBs from ARIEL Proton target	03/2023

ISAC-ARIEL-ISAC in 2019?

- All dates based on Monte Carlo analysis of schedule
- Current best estimates
- Efforts under way to accelerate schedule

Will be discussed again at Science Week!

Produce World Class Science – ARIEL Target Stations



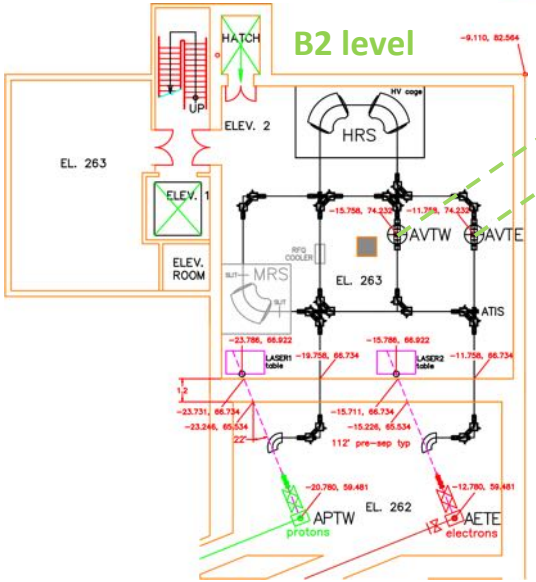
Concepts finalized:

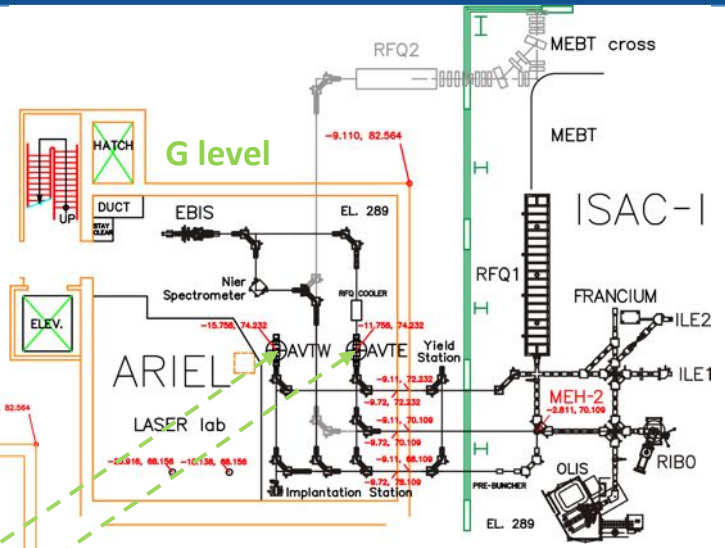
- Operational model
- Direct target exchange process
- Top level maintenance and repair processes
- Target module (target ion source front end, high voltage path, shielding)
- Target station (gas and vacuum management, module interfaces)
- Target pit (shielding, support / alignment structure, main services voids)
- Hot cell, RIB modules, electron beamline
- Shielding concept meets occupancy and dose rate requirements

Work underway!

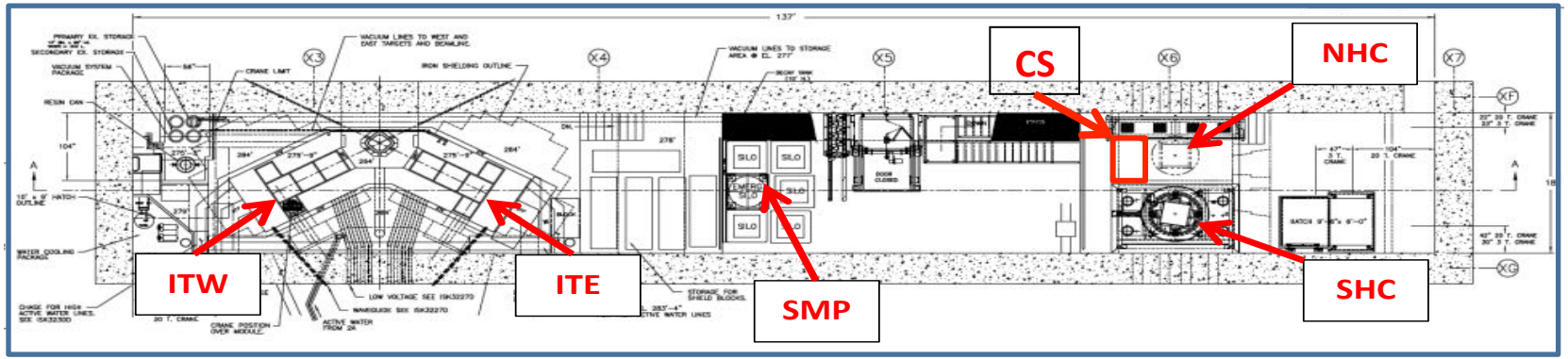
Produce World Class Science – ARIEL-II RIB Transport

- RIB transport system connects target stations to ISAC experimental areas
- HRS magnet finished
- Prototype section installed
  - Qualified vendors
  - Validated design





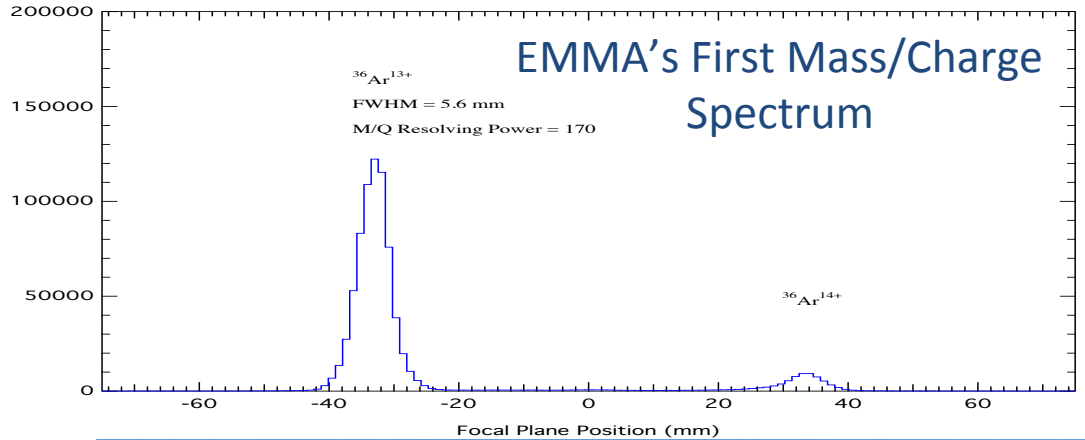
Produce World Class Science – ISAC Upgrades



Infrastructure upgrades to ISAC as well as ARIEL. New Target Module will add redundancy. Refurbished Target Modules will add reliability. Safe Module Parking and North Hot Cell will speed work by removing bottlenecks

Produce World Class Science – Reliability

Produce World Class Science – EMMA



SAINT MARY'S UNIVERSITY SINCE 1802

SFU SIMON FRASER UNIVERSITY

UNIVERSITY of GUELPH

McMaster University

TRIUMF

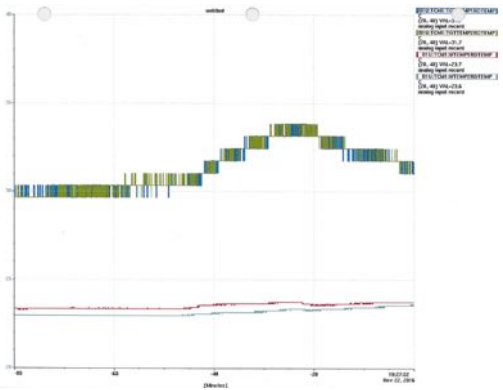
Produce World Class Science – UCN

- Beamline hardware finished (May)
- Room temperature and cold moderators installed (Sept)
- First proton injection (Nov)
- First beam on target and neutron production (Nov)
- First cold neutron production (Nov)
- 10 neutron activation runs at 7 different temperatures (Nov to Dec)

Proton beam centered on beamline monitor

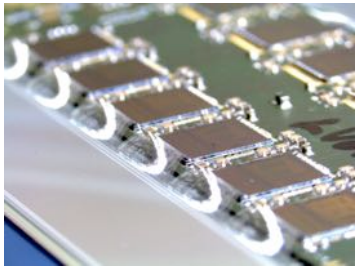
Control room celebrations

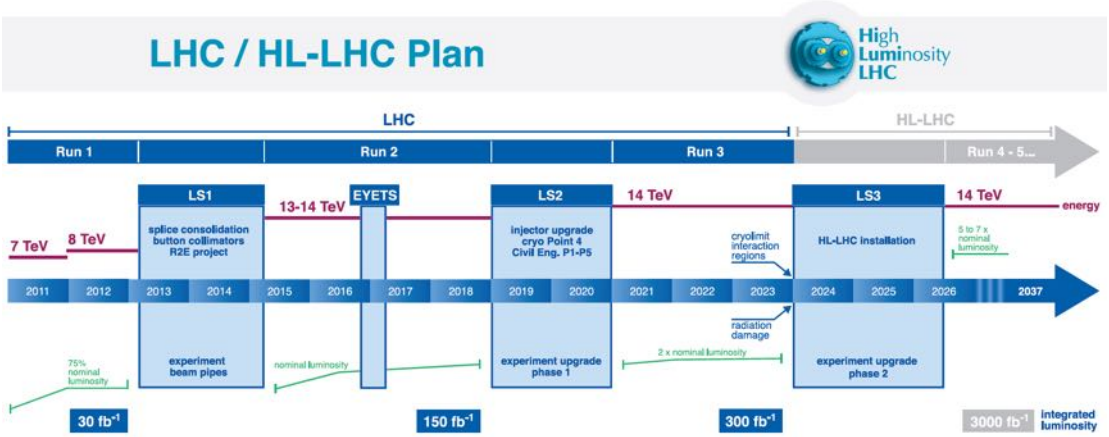
Target temp. increase

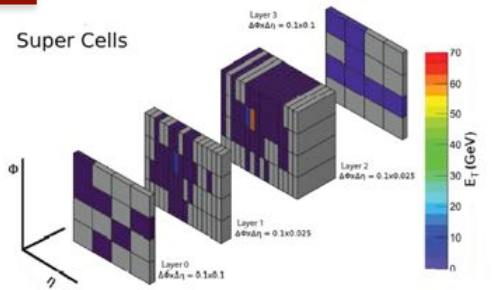


Produce World Class Science – ATLAS Upgrades

- At TRIUMF, preparations proceed apace for ATLAS and LHC upgrades
  - Muon New Small Wheel
  - LAr Calorimeter electronics
  - ATLAS Inner Tracker
  - HL-LHC beam-beam interactions







Plus: Pierre Savard elected Physics Coordinator for 2018-19!

Produce World Class Science – ATLAS Tier 1 Centre

TRIUMF

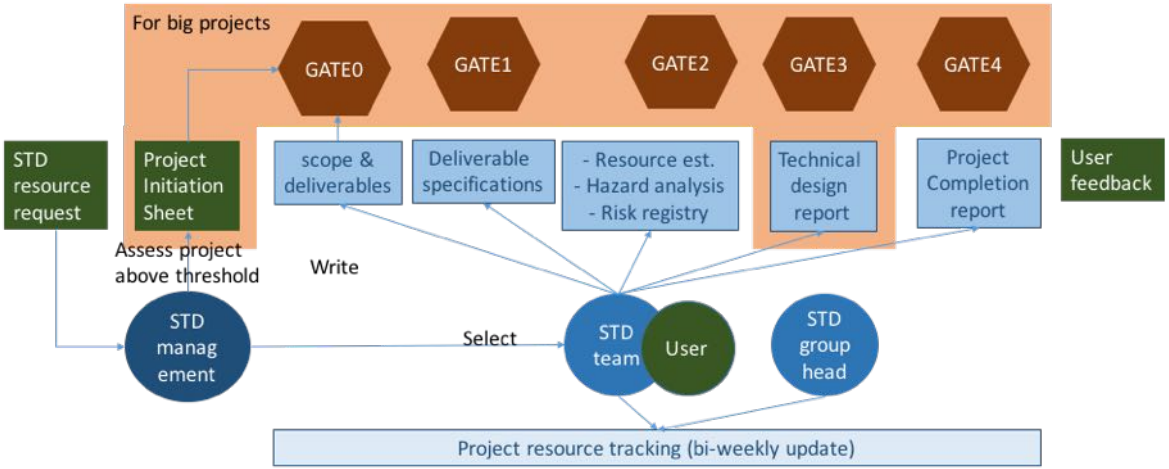
SFU

compute canada | calcul canada

INNOVATION.CA
CANADA FOUNDATION FOR INNOVATION | FONDATION CANADIENNE POUR L'INNOVATION

Upgrading service to community!

- Better communications
  - CAP
  - Science Week
  - Online submission
- Better project management
  - Workflow tracking
  - Lifecycle planning
  - Service representative



For more information, contact Fabrice Retière

Produce World Class Science – ALPHA

First laser spectroscopy on anti-H

M. Ahmadi et al., Nature 541 (2017)

LETTER

OPEN
doi:10.1038/nature21040

Observation of the 1S–2S transition in trapped antihydrogen

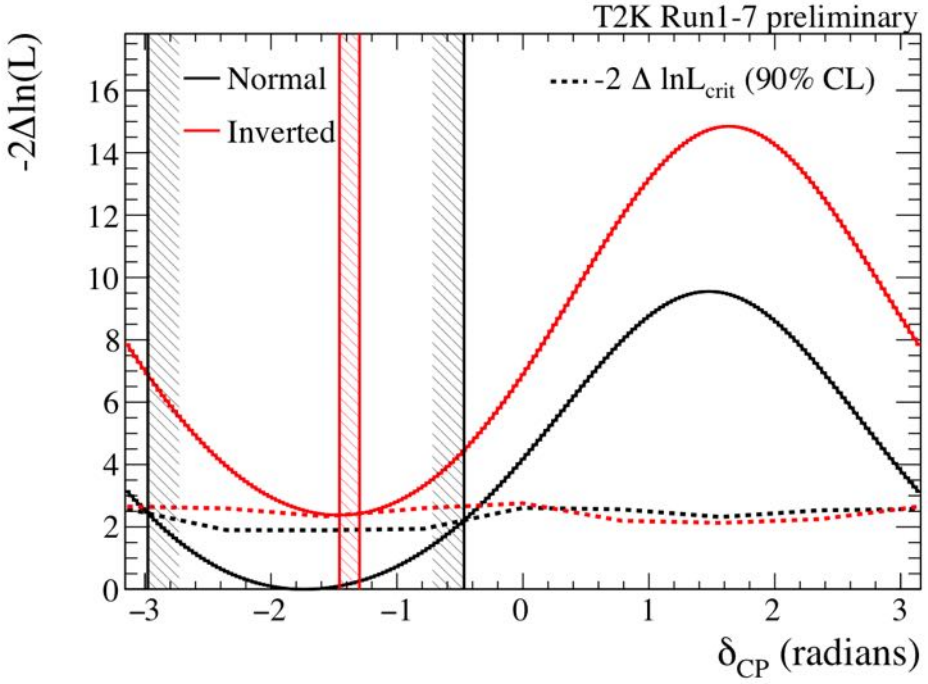
M. Ahmadi[1], B. X. R. Alves[2], C. J. Baker[3], W. Bertsche[4,5], E. Butler[6], A. Capra[7], C. Carruth[8], C. L. Cesar[9], M. Charlton[3], S. Cohen[10], R. Collister[7], S. Eriksson[3], A. Evans[11], N. Evetts[12], J. Fajans[8], T. Friesen[2], M. C. Fujiwara[7], D. R. Gill[7], A. Gutierrez[13], J. S. Hangst[2], W. N. Hardy[12], M. E. Hayden[14], C. A. Isaac[3], A. Ishida[15], M. A. Johnson[4,5], S. A. Jones[3], S. Jonsell[16], L. Kurchaninov[7], N. Madsen[3], M. Mathers[17], D. Maxwell[3], J. T. K. McKenna[7], S. Menary[17], J. M. Michan[7,18], T. Momose[12], J. J. Munich[14], P. Nolan[1], K. Olchanski[7], A. Olin[7,19], P. Pusa[1], C. Ø. Rasmussen[2], F. Robicheaux[20], R. L. Sacramento[9], M. Sameed[3], E. Sarid[21], D. M. Silveira[9], S. Stracka[22], G. Stutter[2], C. So[11], T. D. Tharp[23], J. E. Thompson[17], R. I. Thompson[11], D. P. van der Werf[3,24] & J. S. Wurtele[8]

- First demonstration:
  - Precision already 2×10^{-10}
    $\Delta f \sim 400$ kHz
  - Sensitive to antiproton internal structure at 20% level
- Major Canadian contributions
  - Cryostat with laser access
    - RTI-funded. TRIUMF/Calgary
  - Annihilation detection
    - TRIUMF
  - Magnetometry
    - SFU/UBC
  - Laser cooling development
    - UBC/TRIUMF
  - Operation & Run Coordination

SFU SIMON FRASER UNIVERSITY THINKING OF THE WORLD
UBC THE UNIVERSITY OF BRITISH COLUMBIA
TRIUMF
YORK UNIVERSITÉ UNIVERSITY
UNIVERSITY OF CALGARY

Produce World Class Science – T2K

- Aim: Double neutrino-mode statistics in next run
  - Improved analysis gives increased acceptance
  - Increased intensity provides more PoT
- Hyper-K selected by Science Council of Japan

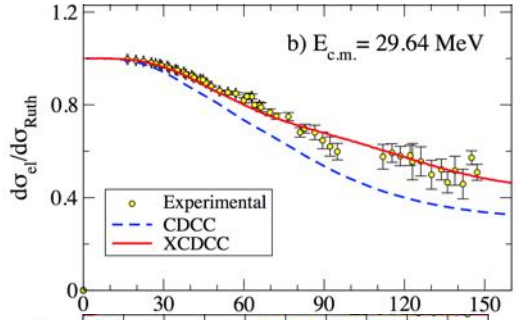


Produce World Class Science – TIGRESS

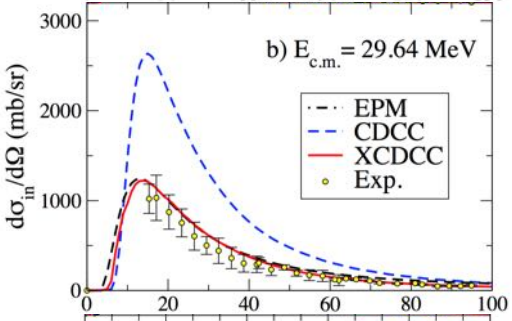
- Exclusive measurement of halo nucleus ^{11}Be scattering from high-Z target
- Differential cross sections understood if excited ^{10}Be core structure is taken into account
- Possible at TRIUMF-ISAC because of
  - Intense ^{11}Be from ISAC-TRILIS, high-quality acceleration with ISAC-II
  - TIGRESS experimental infrastructure capable of coupling to dedicated external detectors

V. Pesudo et al, Phys. Rev. Lett. 118, 152502 (2017)

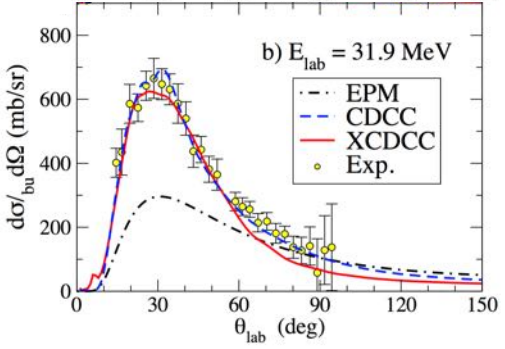
Elastic
-> ^{11}Be



Inelastic
-> ^{11}Be*
-> ^{11}Be+γ

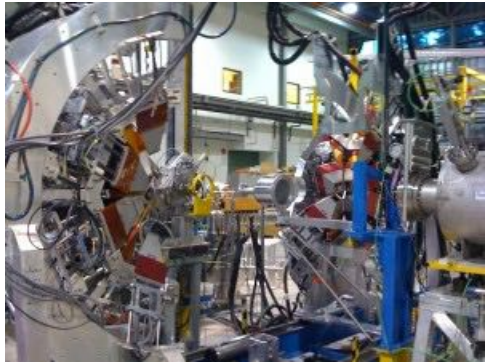


Breakup
-> ^{10}Be(+n)



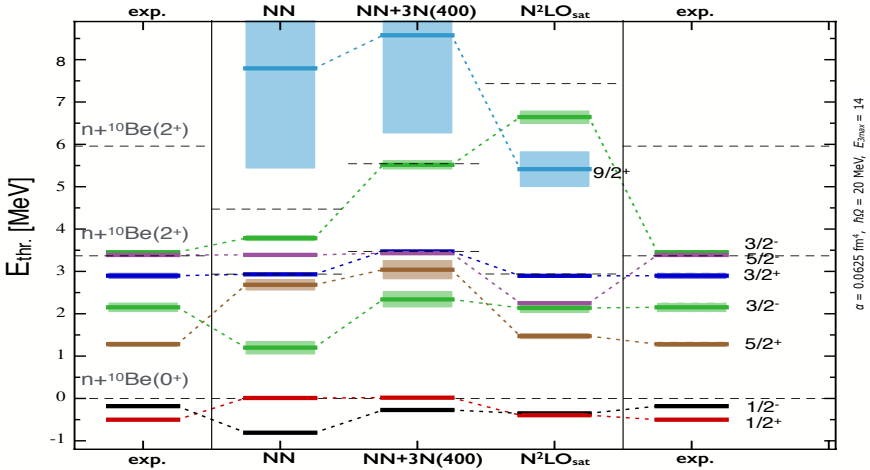
TIGRESS
collaboration

Colorado School of Mines
UNIVERSITY of GUELPH
UNIVERSIDAD DE SEVILLA
TRIUMF
CSIC



First principles study of ^{11}Be (weakly bound halo nucleus with exotic properties)
Ab initio calculations demonstrate:

Contributions from chiral nuclear forces

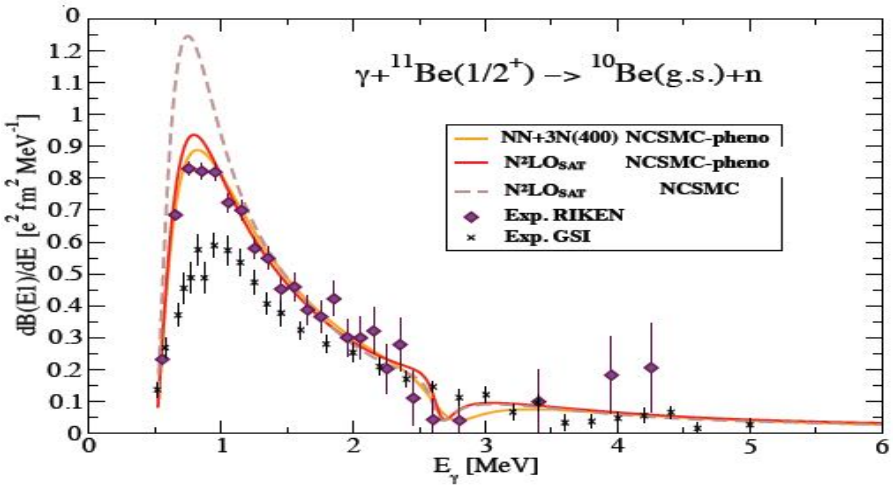


PRL 117, 242501 (2016) PHYSICAL REVIEW LETTERS week ending 9 DECEMBER 2016

Can *Ab Initio* Theory Explain the Phenomenon of Parity Inversion in ^{11}Be?

Angelo Calci,[1,*] Petr Navrátil,[1,†] Robert Roth,[2] Jérémy Dohet-Eraly,[1,‡] Sofia Quaglioni,[3] and Guillaume Hupin[4,5]
[1]*TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia V6T 2A3, Canada*

Discrimination between conflicting photo-dissociation experiments



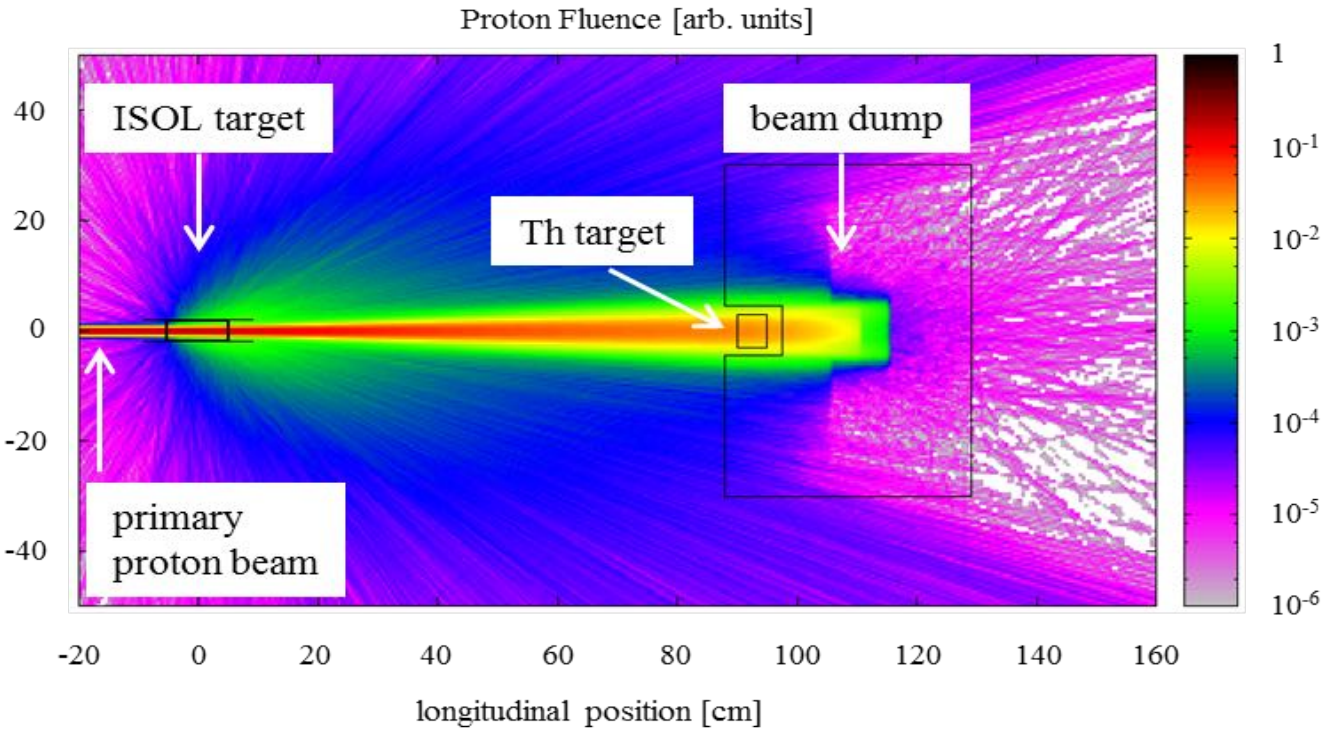
Also ^{6}He

PRL 117, 222501 (2016) PHYSICAL REVIEW LETTERS week ending 25 NOVEMBER 2016

How Many-Body Correlations and α Clustering Shape ^{6}He

Carolina Romero-Redondo,[1,*] Sofia Quaglioni,[1,†] Petr Navrátil,[2,‡] and Guillaume Hupin[3,§]

Produce World Class Science – Alphas



Canadian Nuclear Laboratories

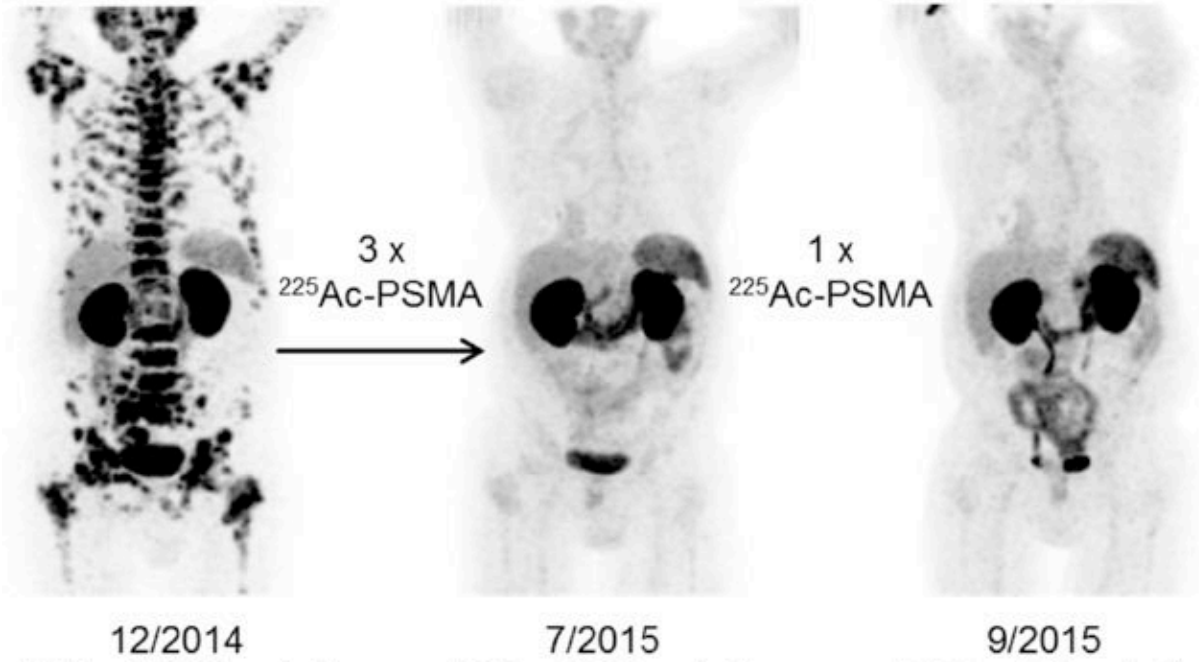
Laboratoires Nucléaires Canadiens

U.S. DEPARTMENT OF ENERGY

CFI 2017 Innovation Fund Proposal: ARIEL Symbiotic Target

In support of IAMI: Institute for Advanced Medical Isotopes

Prostate cancer patient before and after treatment with ^{225}Ac-PSMA



TRIUMF is one of a few facilities in the world that can produce such isotopes

Strategic Goals

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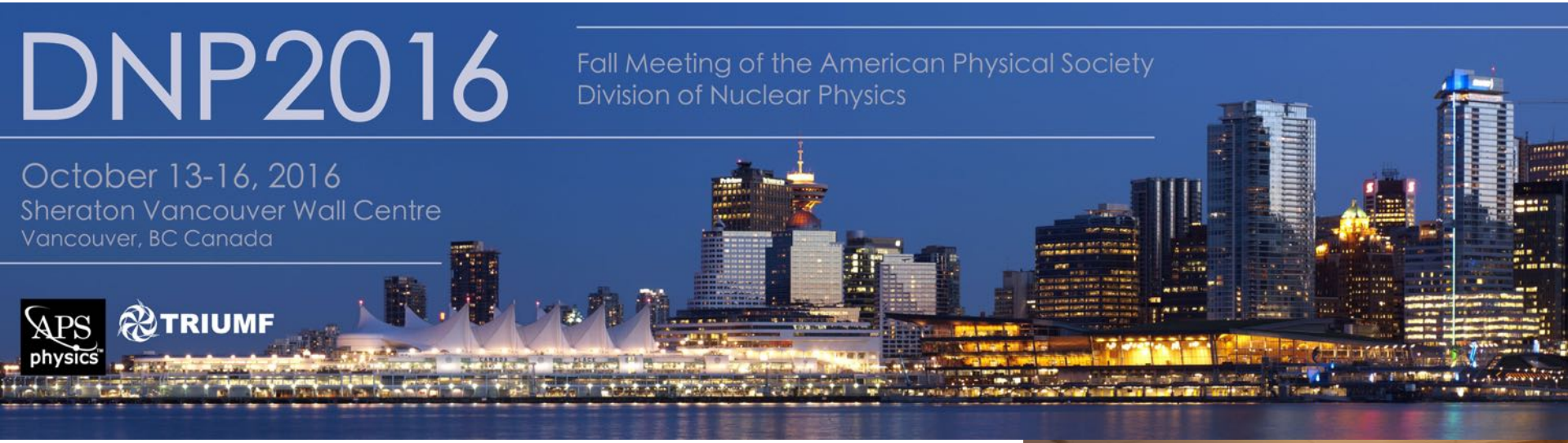
Connect TRIUMF to the World – Events



- APS DNP Annual Meeting held in Vancouver
  - 668 registered participants
  - 168 undergraduate students!

Connect TRIUMF – 2017 Summer Institute

Home

Important Dates

Location and travel

The next TRIUMF Summer Institute (TSI 2017) will be held from July 24th to August 4th, 2017 at TRIUMF in Vancouver, Canada. The theme for TSI 2017 is **"Modern Tools for Nuclear Astrophysics"** and will focus on the three research pillars of nuclear astrophysics: experiments, observations, and astrophysical modelling.

Confirmed lecturers:

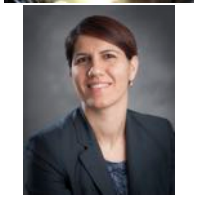
- Jeremy Heyl (U of British Columbia, Canada): "Nuclear Astrophysics with MESA"
- Jordi Jose (UPC Barcelona, Spain)
- Alison Laird (U of York, UK)
- Julie Lutz (U of Washington, Seattle, USA): "Symbiotic Stars: A Very Variable Class of Variables"
- Jaymie Mathews (U of British Columbia, Canada): "Goldilocks and the 3000+ Worlds: Looking for exoplanets that are "just right""
- Marco Pignatari (U of Hull, UK)
- Artemis Spyrou (NSCL and Michigan State University, USA)
- George Wallerstein (U of Washington, Seattle, USA): "Stellar chemical composition research in the photographic era" and/or "Variable stars of population II"
- David Yong (ANU Canberra, Australia): "Chemical abundances in metal-poor stars" and "High precision chemical abundances"

Organizers:
Iris Dillmann (TRIUMF/ UVic, chair)
Barry Davids (TRIUMF/ SFU)
Dana Giasson (TRIUMF)
Marcello Pavan (TRIUMF)
Chris Ruiz (TRIUMF/ UVic)
Kim Venn (UVic)









TRIUMF JINA-CEE CINP ICPN University of Victoria ARC

The 2017 Federal Budget contained proposals relevant to TRIUMF

- Increased funding (now $950M) for the supercluster program
- Commitment to develop a federal science infrastructure strategy
- Impact Canada Fund: New "challenge-based" funding program to fund research into issues of national importance
- Innovative Solutions Canada: An SBIR-like procurement program to build capacity

The Fundamental Science Review report was released on April 10. (The report is non-binding and the government has not yet committed to acting on the proposals)

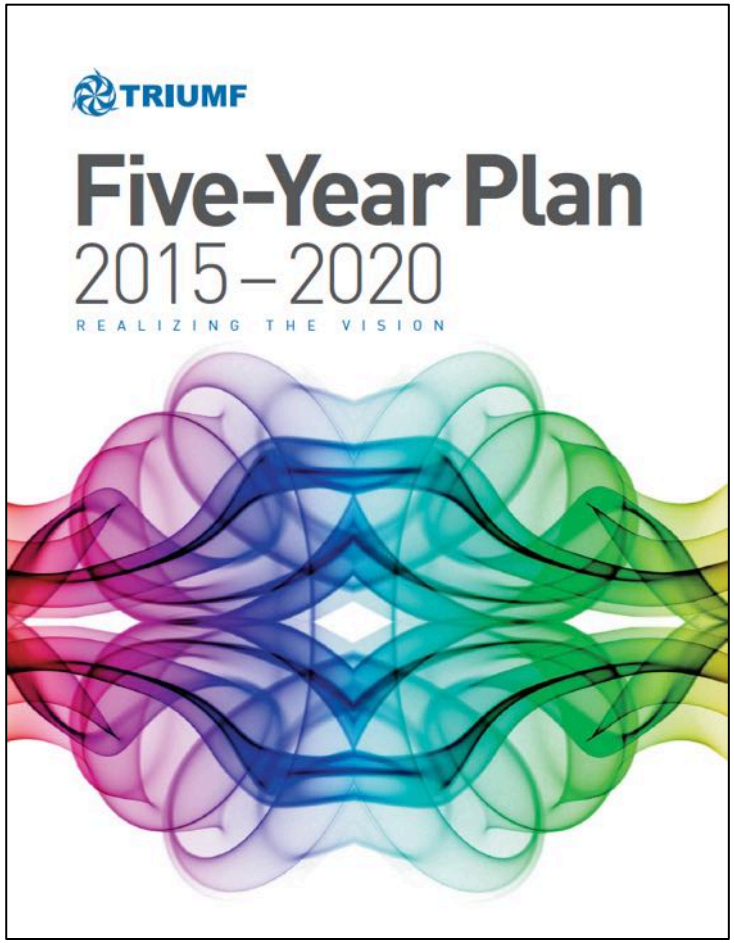
The report's recommendations can be grouped into three major themes:

- Improving federal coordination and oversight
- Increasing funding – especially for investigator-led research grants
- Strengthening the support and planning for major research facilities

What will it mean for TRIUMF?

TRIUMF INNOVATIONS

- TRIUMF's business-facing arm
- Deeply integrated into TRIUMF
- Links cutting-edge science and technology to tangible business opportunities
- Works closely with University-Industry Liaison Offices



Five-Year Plan 2020-2025

Five-Year Plan 2020-2025

- **Purpose:**
  - Articulate TRIUMF's vision and mission
  - Communicate goals and priorities for 2020-2025 & beyond
  - Lay out an action plan, including a high level budget
  - Secure base funding for operations
- **Audience:**
  - Community
  - International Peer Review Committee
  - NRC
  - Government of Canada
- **Timeline:**
  - Consultation and internal planning through 2017
  - Main elements to be defined in Spring 2018
  - Report to be released in September 2018

- **Consultation:**
  - **Internal strategic planning exercises**
    - Divisional and institutional
  - **Broad community consultation**
    - Science Week, July 10-14
    - Submissions to PPAC, TRIUMF's Policy and Planning Advisory Committee
- **Governance:**
  - **Executive Committee** drives planning
  - **Steering Committee** oversees the process
  - **PPAC** evaluates projects and commitments
  - **ACOT** reviews main elements of the plan
  - **Board of Management** approves the plan

Charge and Members

- Oversee the consultation process and solicit input from the relevant stakeholder communities
- Provide critical feedback on the priorities and initiatives, ensuring that they align with stakeholder interests
- Act as review panel for the final plan and the associated communications strategy

Name	Title	Institution
Jonathan Bagger	Director	TRIUMF
David Castle	Vice President Research	University of Victoria, Vice Chair TRIUMF Board
Rod Clark	Division Deputy	Lawrence Berkeley Lab, former SAP-EEC Chair
Robert Dunlop	Former ADM (retired)	(Industry Canada)
Kathryn Hayashi	President and CEO	TRIUMF Innovations
Ritu Kanungo	Professor	Saint Mary's University
Oliver Kester	ALD - Accelerator Division	TRIUMF
Suzanne Lapi	Associate Professor	University of Alabama, Birmingham
Kyle Leach	Assistant Professor	Colorado School of Mines, TUEC Chair
Graeme Luke	Professor and Chair	McMaster University
Scott Oser	Professor	University of British Columbia
Nigel Smith	Director	SNOLAB
Brigitte Vachon	Associate Professor	McGill University
Michelle Wong	Director, Research	University of British Columbia

Charge

- Articulate TRIUMF's value to stakeholders
    - Evaluate proposals submitted to TRIUMF
        - Nuclear Physics
        - Particle Physics
        - Molecular and Materials Science
        - Life Sciences
        - Accelerator Science
    - Identify priorities for ongoing activities and new initiatives
- Answer key questions
    - What are the strengths and weaknesses of the current areas of activity?
    - What are potential new areas of activity?
    - Which of the ongoing activities should be increased?
    - Which of the ongoing activities should eliminated?

Members

- Corina Andreoiu (SFU)
- Jean-Francois Arguin (Montréal)
- David Asgeirsson (TRIUMF Innovations)
- Sampa Bhadra (York)
- Paul Garrett (Guelph)
- Darren Grant (Alberta)
- Brigitte Guerrin (Sherbrooke)
- Garth Huber (Regina)
- Hae Young Kee (Toronto)
- Bob Kowalewski (UVic) - Chair
- Alison Lister (UBC)
- Andrew MacFarlane (UBC)
- Juliette Mammei (Manitoba)
- Tony Noble (Queen's)
- Rachid Ouyed (Calgary)
- Frank Prato (Western)
- Jeff Quilliam (Sherbrooke)
- Ralf Schirmacher (Calgary)
- Jeff Sonier (SFU)
- Vesna Sossi (UBC)
- Hiro Tanaka (Toronto)
- Manuela Vincter (Carleton)

Five-Year Plan – Structure and Timeline

January 11, 2017	ARIEL Town Hall
May 26, 2017	Call for PPAC Proposals
July 10-14, 2017	Science Week
October 16, 2017	PPAC deadline
Fall 2017	PPAC review of proposals
Winter 17/18	Formulation of plan
Winter 2018	Consultation on plan
Spring 2018	ACOT review / Board approval
September 2018	Release of FYP 2020-2025
Fall 2018	International Peer Review
Fall 2018	Lobbying push in Ottawa

- Five-Year Plan 2020-25 will contain
  - A high-level summary for Ministers
  - A 20 page strategic plan for Analysts
  - A 50 page implementation plan for ACOT, Peer Review Committee
- Additional background on a new TRIUMF website
  - Facility information
  - Science highlights 2013-2018
  - CVs of Research Scientists

Plan will go public in September 2018

Communication and promotion will be done with 50th Anniversary Celebration in 2018

Five-Year Plan – PPAC Proposals

- PPAC submission will form the basis for prioritizing any and all activities that involve commitments of the laboratory's resources and expertise

- We are encouraging the community to put forward innovative ideas, and in particular initiatives that bridge across individual fields of research and take advantage of TRIUMF's diverse capabilities

- For all submissions of new project commitments, the PPAC review constitutes the Gate 0 review of TRIUMF's project governance process. In particular, all initiatives that will involve a proposal to the next round of calls by CFI, anticipated for 2018/19, and involve TRIUMF resources are expected to submit a proposal to PPAC

- For initiatives that might go forward to future CFI funding rounds before 2025 we also expect a proposal submission to PPAC now, if the resources requested from TRIUMF (cash and manpower) are near or above $1M

http://www.triumf.ca/FYP2020-25

Science Week July 10-14, 2017

	Monday	Tuesday	Wednesday	Thursday	Friday
	10-Jul	11-Jul	12-Jul	13-Jul	14-Jul
AM	Nuclear Physics with ARIEL & ISAC	Molecular and Materials Science with Assorted Probes	Life Sciences with Isotopes and Particle Beams	Particle Physics, Nuclear Physics, and Beyond	TUG AGM
PM		Innovation Pathways	Accelerator Science and Applications		
Evening				BBQ	

- Each workshop will provides opportunities to present and brainstorm for TRIUMF during period 2020-2025 and beyond
- Organizers will convene program that
  - includes summaries of scientific thrusts of major ongoing activities
  - provides forum to present new outside-the-box ideas for new initiatives
- Excellent opportunity to refine ideas for PPAC proposals!


TRIUMF