



Welcome and Introduction

Nigel Smith, ED&CEO



EMBARKING ON A BRIGHT JOURNEY

Land Acknowledgement

TRIUMF is located on the traditional, ancestral, and unceded territory of the x^wməθk^wəy̓əm (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 and knowledge



Code of Conduct

- All participants will treat each other with respect and conduct themselves in a professional manner that is welcoming to everyone and free from any form of discrimination, harassment, or retaliation.
- Discriminatory, harassing, or bullying behaviour or action of any kind will not be tolerated, and will result in immediate removal from this meeting and ban from all future TRIUMF activities and notification of appropriate authorities, if necessary.
- If you believe that you have been subject to or have witnessed behaviour that violates this code of conduct, please report it immediately to the local SW chairs (Chloé Malbrunot, David McKeen, Katherine Pachal)

Overview

- Science Week 2024 features 4 main programme foci:
 - **Showcasing** achievements from the past year and reviewing science and infrastructure drivers for our programme; celebrating 50 years of TRIUMF beam
 - **Planning** future directions following the outcome of our five-year request for support, leading to our five-year implementation plan
 - **Learning** how to support sustainability, EDI and Indigenous knowledge
 - **Networking** with lots of opportunities for the community, students and postdocs to discuss, network, and strongly interact (and kick a ball around!)
- Science Week provides an opportunity to discuss and provide feedback on our five-year implementation plan, divisional objectives and alignment to the 20-year vision

Science Programme Overview

- **Monday:** Introduction; science overviews & recent highlights (ACC, LSCI, NP, Quantum/CMMS)
- **Tuesday:** Science overviews & recent highlights (PP, SCITech, SCiComp); student talk competition
- **Wednesday:** 5-year implementation plan scenarios: overview, divisional perspectives, community viewpoints, general discussion; Poster session
- **Thursday:** 50 years of TRIUMF beam; Sustainability session; Parallel sessions on R&D strategy, engineering/technical teams, early career
- **Friday:** TUG meeting and early career workshop



EDI, Indigenous Knowledge and Outreach

- **Monday:** Public Lecture (Dr. Tom Ruth) *“From Vision to Seeing: Tracing the brief history of positron emission tomography in BC and Canada”*
- **Tuesday:** EDI Session on allyship: invited talk from Dr. Toni Schmader *“Engendering Success and Allyship in STEM”*
- **Wednesday:** Indigenous knowledge: invited talk from Dallas Kelly *“Weaving Indigenous Knowledge with Mainstream Science using Canada’s Synchrotron”*
- **Thursday:** 50 years of TRIUMF beam - emeritus’ talks
- **Friday:** IAMI tour



Networking and Social Events Overview

- **Monday:** Welcome reception
- **Tuesday:** “Science pitch” student talk competition; Five-a-side football finals
- **Wednesday:** Poster session
- **Thursday:** Early career networking parallel; Networking event and BBQ at UBC Farms
- **Friday:** TUG meeting, Early career workshop



280 participants (88 students, 28 invites speakers & 25 virtually)



EMBARKING ON A BRIGHT JOURNEY

Chloé Malbrunot

Rupan Brar
Wojtek Fedorko
Kenji Kojima
Petr Navratil
Stephanie Radel
Jana Thomson

David McKeen

Diana Castaneda
Gabby Gelinias
Bob Laxdal
Marcello Pavan
Pascal Reiter

Kate Pachal

Chris Chambers
Andrew Ikeman
Annika Lennarz
Thomas Planche
Samia Schowdhury

Christian Diget
Iain McKenzie
Xiaoyue Li
Valery Radchenko
Oliver Stelzer-Chilton

Many thanks to our sponsors:



TRIUMF Brief Updates

TRIUMF continues to deliver major progress on many fronts...

- Outstanding successes in federal operational funding, and provincial support for IAMI
- Major progress on science programmes, infrastructure and platforms, including substantial progress on IAMI and ARIEL, domestic and international science projects
- Rework of CNSC relationship led to multiple successful updates in License Conditions Handbook, and improved interactions
- Substantial engagement of TRIUMF in international community planning
- Continued positive evolution of our governance structure, and development of governance and oversight processes (Board, Members, NRC, ACOT, ...)
- Development of new required capabilities around research and IP security
- Successful acquisition of spin-out company (ARTMS0 and development of commercial portfolio)

2020-25 NRC KPIs

	published scientific papers
	highly qualified personnel trained
	Canadian scientists & students using TRIUMF
	Canadian scientists & students participating in research abroad through TRIUMF
	international visiting scientists & students
	informal science experiences to the public
	commercial revenues

Target	2020/21	2021/22	2022/23	2023/24	2024/25
285 (CY)	317	285	247	361	PENDING
156 (FY)	223	301	275	315	PENDING
206 (CY)	127	90	330	289	PENDING
195 (CY)	224	224	243	278	PENDING
392 (CY)	48	97	294	325	PENDING
15,000 (FY)	8,375	10,327	10,780	17,103	PENDING
\$3.0M (FY) (net)	\$5.4M (\$3.3M net)	\$7.6M (\$5.1M net)	\$8.5M (\$4.6M net)	\$4.98M (\$0.56M net)	PENDING

50 Years of Beam

On December 15, 1974, the activation of TRIUMF's 520 MeV cyclotron, which has been producing pure proton beams ever since, spurred a dynamic shift in the landscape of Canadian physics and launched TRIUMF's broad and internationally renowned science program



Four Key Priorities for 2024

- 1. Development of budget in response to final funding level received
 - Scenario planning provides base line options, will require finessing based on final levels of support and any other direction from government
- 2. Development and finalisation of contribution agreement with NRC to allow funds to flow
 - Required through summer 2024? NRC input required
- 3. Initiation of “Weft and Warp”
 - Completion of discovery; iterations of planning and implementation
- 4. Development and conclusion of next five-year plan
 - Community consultation through summer (Science Week) in concert with development of contribution agreement, release can follow sign-off of CA, but needs clear definition

Weft and Warp (noun)

- The essential foundation of an organization (from weaving)
- We are rebuilding the fabric of the laboratory systems



D. Preddy

▶ **the warp** [S] • FABRICS & FASHION • specialized



the threads that go along the length of a piece of cloth or a loom (= a special frame for making cloth)

Compare

the weft specialized

the weft

noun [S] • FABRICS & FASHION • specialized

UK /weft/ US /weft/

Add to word list

the threads that go across the length of a piece of cloth or a loom (= a special frame for making cloth)

Compare

warp noun

Why do we need to do this?

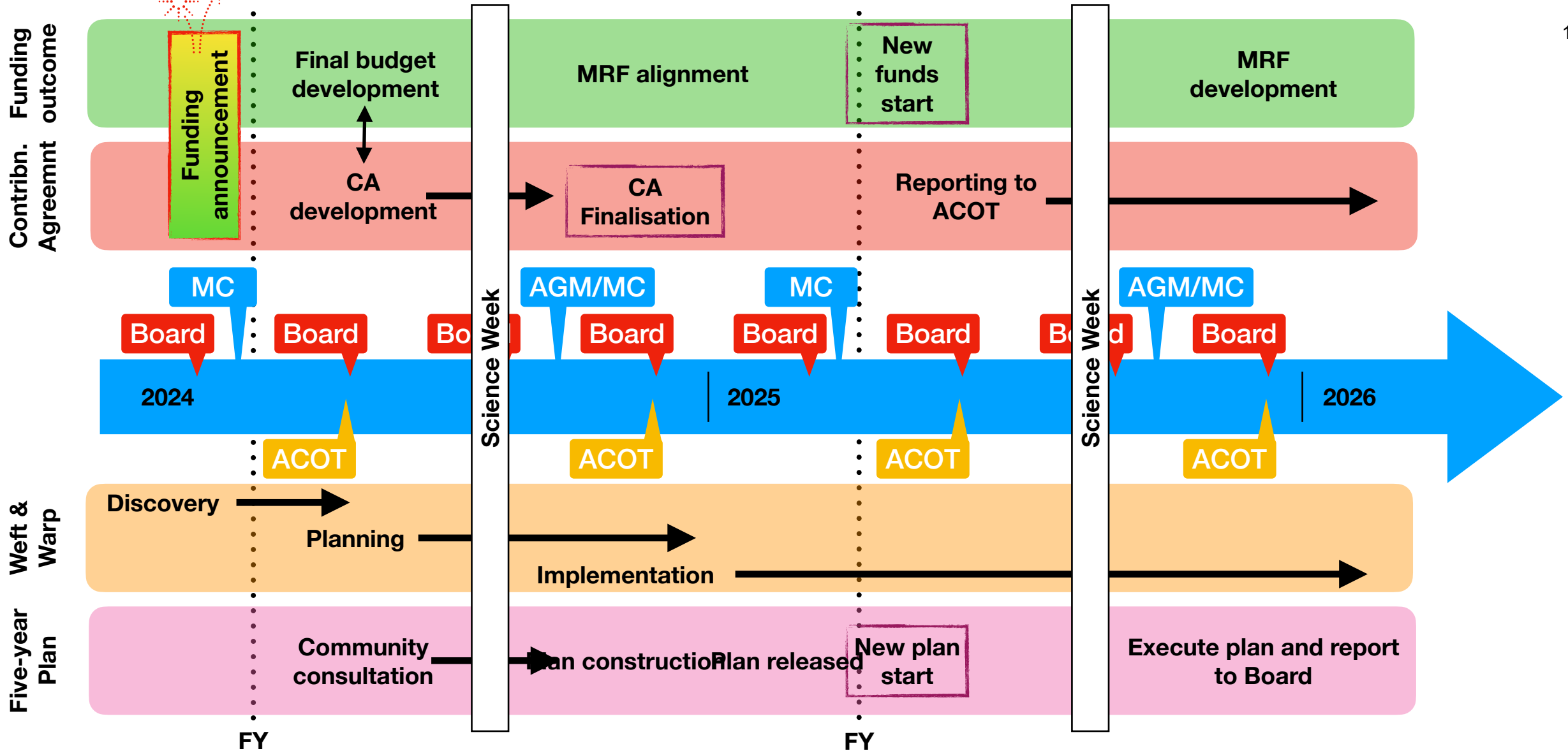
- We need to develop operational excellence across TRIUMF processes
- We are not compliant with regulatory requirements (N286-12), which led to (our) suspension of operations and **loss of science**
 - CNSC report and subsequent Board ad-hoc report highlight systemic issues in how we undertake work, communicate, manage change, etc.
- These comments are derived primarily from discussions with the team, as well as evaluation of records, etc.
- We are inefficient due to multiple systems and processes existing (overlap and gaps exist) - we are not demonstrating operational excellence
- External changes and requirements (cyber, security, cons, ...)
 - Change in the type of work we are doing
- New governance structure providing greater oversight and accountability (the Board has greater visibility of issues and concerns)

Requirements of N286-12

- N286-12 is a standard that describes good practice for management systems for nuclear facilities (part of the CNSC requirements)
- The “12” refers to 2012 when it was released, TRIUMF remains out of compliance
- There are 12 principles that define good management practices --->
- Weft and Warp is looking to develop our management systems and processes – we will naturally be N286-12 compliant as a result

1	Safety is the paramount consideration guiding decisions and actions
2	The business is defined, planned and controlled
3	The organization is defined and understood
4	Resources are managed
5	Communication is effective
6	Information is managed
7	Work is managed
8	Problems are identified and resolved
9	Changes are controlled
10	Assessments are performed
11	Experience is sought, shared and used
12	The management system is continually improved

Timeline threading



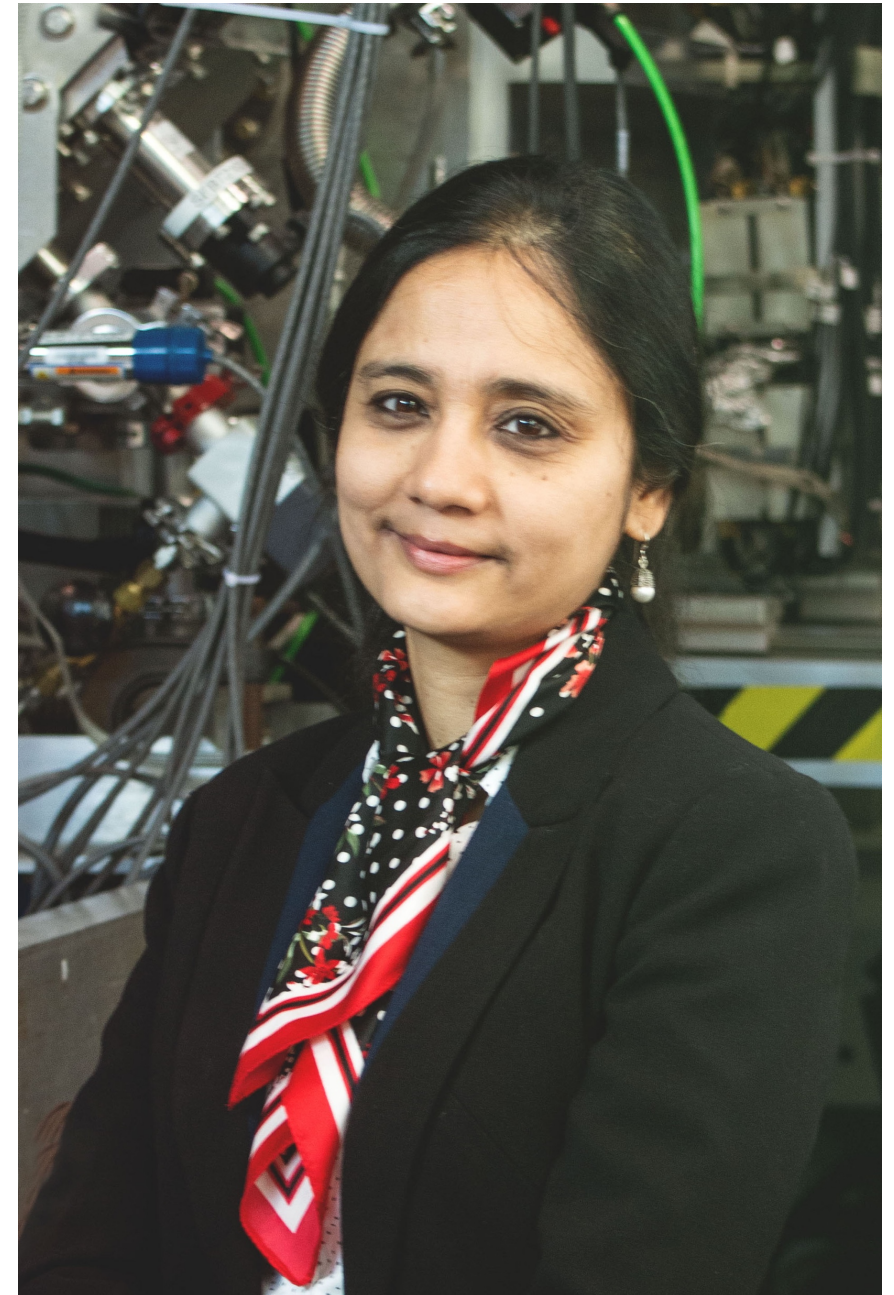
Organisational Updates

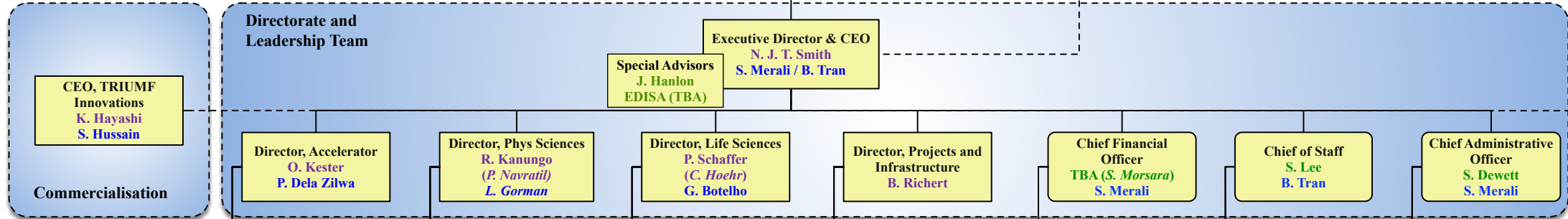
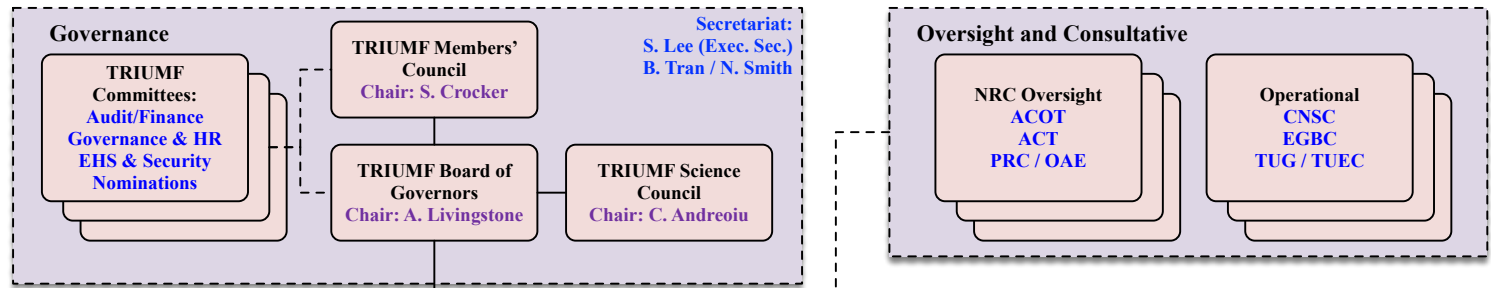
Organisational leadership changes

- PSD Director appointed (next slide)
- Life Sciences Director role will be held interim by Conny Hoehr while Paul is on sabbatical leave over the summer
- RSO position has been filled by Roxana Ralea, who was previously at TRIUMF. Wealth of experience on nuclear systems from time managing compliance in Health
- Victor Saenz Balderas will take on CSO role as Rock returns to the US
- Occupational Health and Safety manager role in development (symmetrical to RSO)
- CFO recruitment being developed with head-hunter agency. Job description under review
- EDI Special Advisor role recruitment underway (slower than hoped)
- Several changes in executive admin and administrative assistant roles
- Senior Management Meeting has been reconfigured to provide the tactical delivery and operational oversight for TRIUMF, now comprises Divisional and Departmental leads only

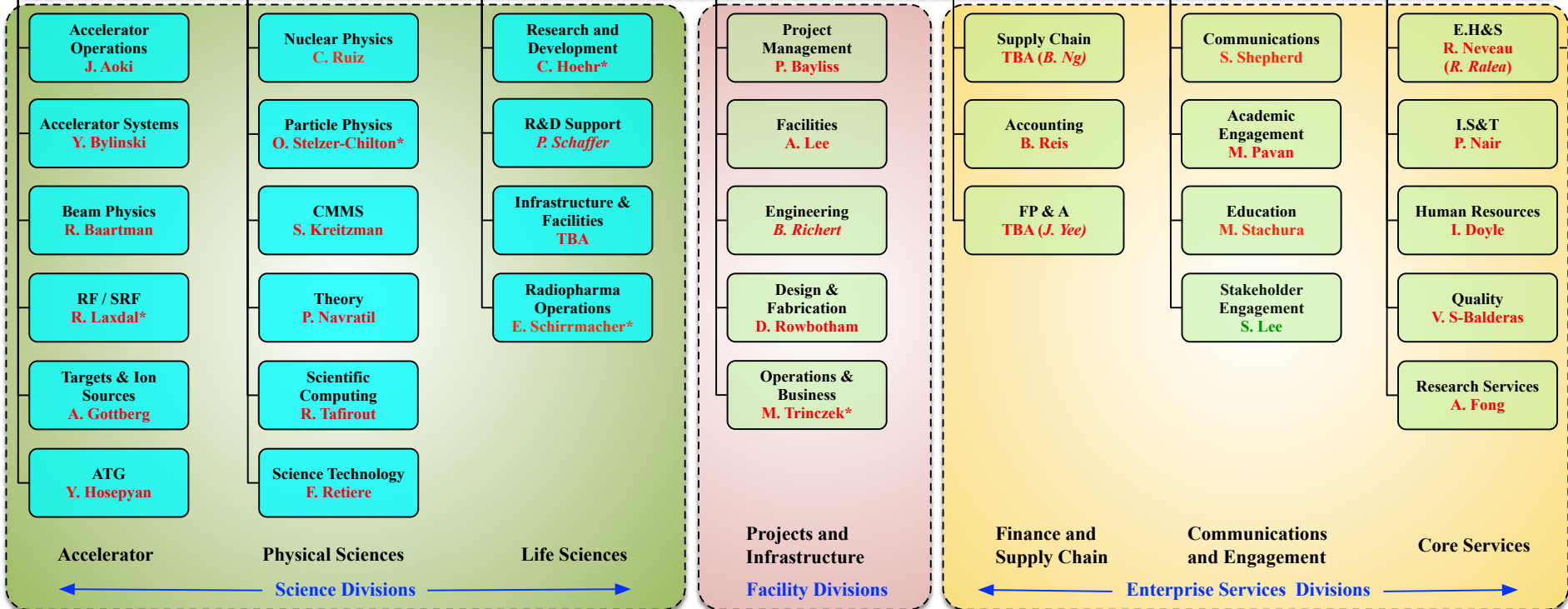
PSD Director Search

- Dr. Rituparna Kanungo (Ritu) has accepted our offer to become the next PSD Director
- Ritu is well known to TRIUMF, and knows TRIUMF well, having worked here for many years and leading CANREB
- A recent Canadian Association of Physicists Fellow, and recipient of the 2018 CAP-TRIUMF Vogt award
- Ritu will join us in September
- Many thanks to Petr who has stewarded the Division since summer 2021, and who has graciously agreed to continue in this role until September.





- Additional Responsibilities and Contacts**
- | | |
|-------------------------|--------------------------|
| Chief Engineer | Bill Richert |
| Chief Safety Officer | Rock Neveau |
| Radn. Safety Officer | Roxana Ralea |
| Fire Safety Director | Terry Sanghera (interim) |
| Ombudsperson | Grace Wong Sneddon |
| GAPS Liaison | Monika Stachura |
| Research Grants Officer | Petr Navratil |
| Privacy Officer | Pradeep Nair |
| Media Contact | Stuart Shepherd |
| BAE Liaison Chair | Barry Davids |
| P&S Liaison Chair | Doug Preddy |
| Tech Liaison Chair | Maico Dalla Valle |
| Security Officer | Adrian Lee |
| Research Security Off. | Ann Fong |
| Trade Compliance Off. | Cynthia Reis |
| Cyber Security Officer | Uttej Reddy |
- Joint Health and Safety Committee Members:
<https://www.triumf.ca/jhsc/jhsc-membership>



TBA: to be appointed
 *Division Deputy

EDI Strategy - current actions

- EDI Action Plan developed through EDI Committee and Officer, shared with Board at previous meetings. All Phase-I and most of Phase-II actions complete, including reserved childcare places, multi-function room, free sanitary products, policy review and evolution, land acknowledgement, pronoun use, EDI calendars, etc.
- Mentorship of early career / under-represented groups underway; Scholarship programme launched
- EDI Committee continues to deliver community information, training and awareness programmes - bystander, diversity, etc.
- Engagement with indigenous groups initiated and underway within education & engagement
- KPI development (later slides on KPI overall)

EDI Strategy - longer term

- Core step in longer term strategy is the EDI survey by WinS group; this allows us to understand current perceptions, where changes or additional work are required, and to track progress through subsequent survey and engagement
 - Two stages: initial in-person interviews, followed by broader survey
 - Initial report from interviews of 10% of staff demonstrates scope of responses across broad areas of “life at TRIUMF”
 - Following the conclusion of the survey (Fall 2024) where we aim to gather quantitative data from >80% of the community we anticipate ability to plan and implement recommendations from WiNs
- EDI SA position will have core role in defining changes, implementing through Leadership Team with the authority of the Executive Director
 - Different approach to current EDIC, which has been in place since 2017
 - Anticipate implementation starting end 2024 onwards

Strategic Development

Strategic Planning

- In Fall 2022, our first **20-year vision** was released after 18 months of engagement and discussion with our various communities
 - This sets our aspirations and direction for the lab over the next two decades
- The **NCR quinquennial evaluation** was successfully completed during 2023
 - This included a very fulsome **international peer review** demonstrating the great impact and world-class science being delivered by TRIUMF
- TRIUMF is a trusted member in discussions on the future developments of large-scale science in Canada
 - Hopefully the **Major Research Facility** framework will emerge as a consequence of the broad community discussions (eg Bouchard report)



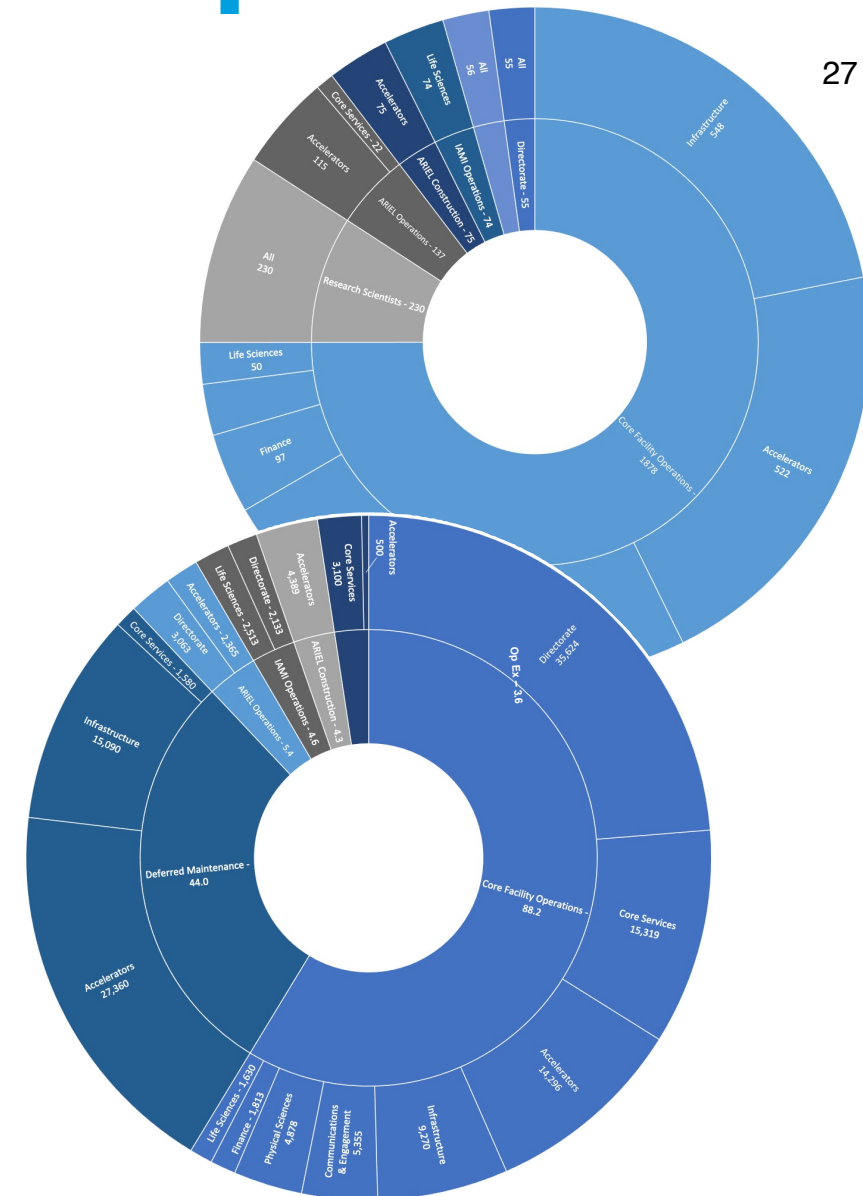
TRIUMF Support and Funding

- Construction and submission of our five-year **Request for Support**, leading to success in recent federal budget and \$400M award
- Provincial support of \$11M for **IAMI phase-II** secured after 18 months of discussion with JEDI and Health
- Collaboration including TRIUMF Innovations successfully secured \$35M for the **Canadian Medical Isotope Ecosystem SIF**
- **Research grants** continue to be successfully secured, currently valued at >\$82M from tri-council and CFI in this five-year plan
- **Strong relationships** have been built with government and funding agencies (first ministerial visit for many years by Champagne, Premier Eby talked directly to Minister Freeland)

Budget 2024 Outcome - Request

TRIUMF requested \$450M in operational funding for period from 2025 – 2030.

- Separating operations, capacity for research and research costs: buy-in from NRC on this approach
- Full investment in TRIUMF capitalizes on a window of opportunity around international facility shutdowns (ISOLDE@CERN) and actinium.
- The requested level of support is necessary to sustain core operations and capacity for research to realize TRIUMF’s full potential for Canada; the added socioeconomic benefits that the laboratory delivers through many of its programs (i.e., medical isotopes, new technologies, spin-off companies, etc.) are not possible without strong and stable facility operations.
- Now is the time for Canada to lead in big science research and assert its place in the international landscape amidst surging competition.



Budget 2024 Outcome - Request

- TRIUMF is at a critical moment in its life cycle as a major research facility; the lab faces a critical inflection point as it balances the demands of aging legacy infrastructure while seeking to complete and operate new world-class facilities.

Five core themes of the request:

1. Delivering new infrastructure for science impact
2. Ensuring operational excellence
3. Training the diverse talent of tomorrow
4. Refurbishing legacy facilities
5. Evolving TRIUMF's program towards the future

	Funding Level			
	≤ 300	350	400	450
Operational excellence	Yellow	Green	Green	Green
IAMI	Orange	Light Green	Light Green	Light Green
Facility utilization	Orange	Yellow	Light Green	Light Green
Domestic research ecosystem	Red	Orange	Light Green	Light Green
Site maintenance	Red	Orange	Yellow	Light Green
Talent and training	Red	Orange	Yellow	Light Green
Major deferred maintenance (BL1A/substation)	Red	Orange	Yellow	Light Green
Innovation & commercialization	Red	Orange	Yellow	Light Green
International research ecosystem	Red	Red	Yellow	Light Green
ARIEL completion	Red	Red	Yellow	Light Green
ARIEL operations	Red	Red	Orange	Light Green

Heat map visualizing various funding-level scenarios, including those of reduced funding from the \$450M request

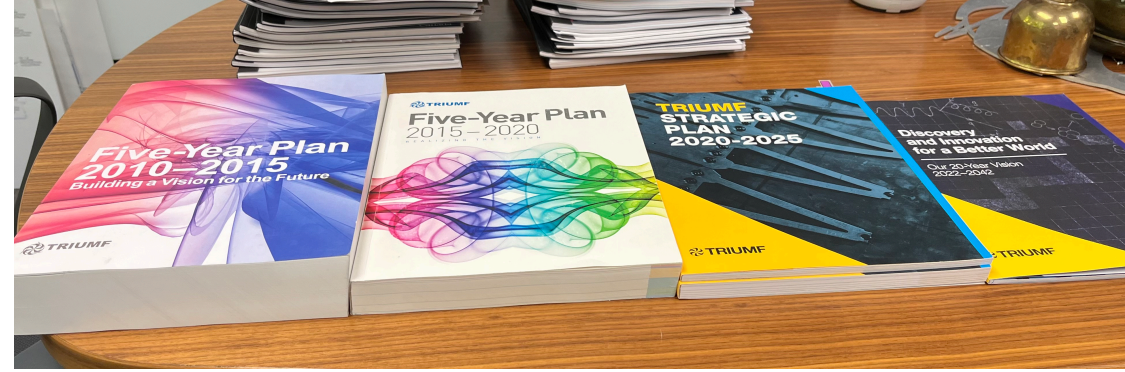
Budget 2024 Outcome - Result

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- “To advance the next generation of cutting-edge research, Budget 2024 proposes major research and science infrastructure investments, including: **\$399.8 million over five years**, starting in 2025-26, to support TRIUMF, Canada’s sub-atomic physics research laboratory, located on the University of British Columbia’s Vancouver campus. This investment will upgrade infrastructure at the world’s largest cyclotron particle accelerator, positioning TRIUMF, and the partnering Canadian research universities, at the forefront of physics research and enabling new medical breakthroughs and treatments, from drug development to cancer therapy.”
- There is no ring fencing on these funds (cf \$25M projects), other than alignment to the five-year plan, and there is some flexibility in terms of profiling across the award. We will work with NRC on profiling.
- We have been communicating to the team how great this result is (a 50% increase in baseline operations during times of incredible fiscal pressure), yet have been trying to dampen expectations as we didn’t get the full request - this will have implications on our programme

Previous Support Levels

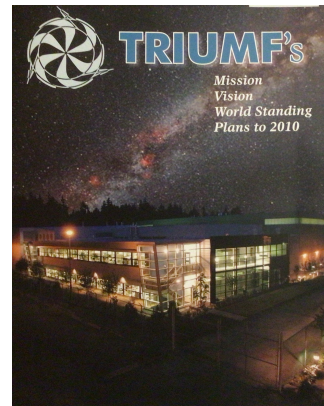
Previous requests followed NRC-led process
Requests delivered flat-flat support, with additional funds from ad-hoc engagement



5-Year Plan 2005 – 2010:

- Targeted funding: \$276.9M
- Funding received: \$222.3M

\$346M@2025



5-Year Plan 2010 – 2015:

- Targeted funding: \$328M*
- Funding received: \$222.3M

\$318M@2025



5-Year Plan 2015 – 2020:

- Targeted funding: \$290M
- Funding received: \$267.3M**

\$350M@2025



5-Year Plan 2020 – 2025:

- Targeted funding: \$320M
- Funding received: \$292.7M***

\$357M@2025



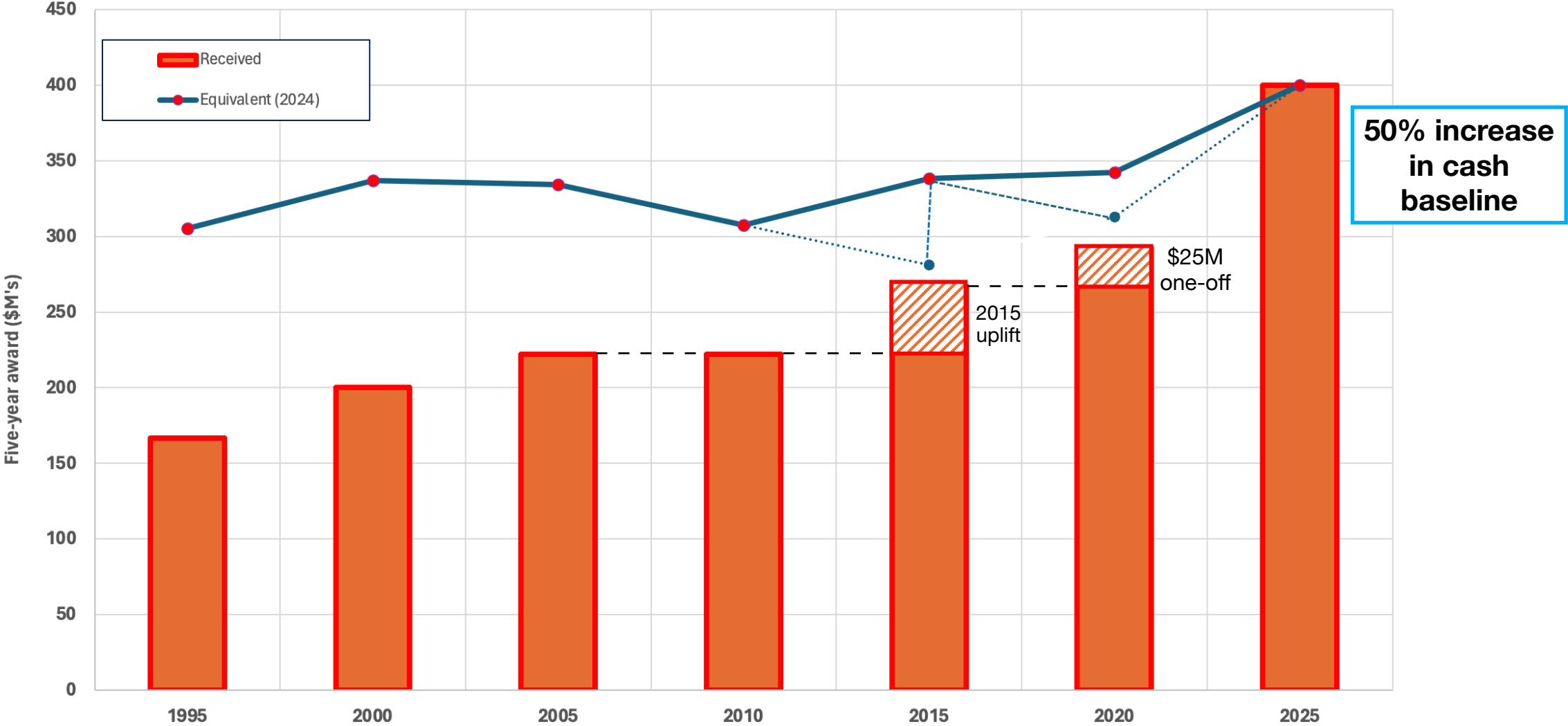
* This request included funding for several projects that would later be supported through the CFI Innovation Fund, including ARIEL and the ATLAS Tier-1

** This funding was allocated in two tranches beginning with an initial \$222.3M commitment in 2014, followed by a \$45M supplement in 2015

*** Finance Canada arrived at this value by starting with the flat-flat amount of \$267.3M and adding a one-time increase of ~\$25M for critical capital projects and deferred maintenance

Budget 2024 Outcome - Context

TRIUMF Funding levels (5-year awards)



Budget 2024 Outcomes

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- Overall, I view this outcome as one that will allow us to stabilise TRIUMF and consolidate on the currently planned operations, infrastructure and programme
- We still have one year to run on the current five-year plan, and will be guiding the organisation to the new plan over the next year
 - This means things will remain very tight over this year, but we have the confidence that the next five years have increased operational support
- Over the next few years, we will have the ability to seize opportunities that may arise, yet need to ensure TRIUMF is operating at maximum efficiency and efficacy
- *Basically, this budget secures the future of TRIUMF operations at its current scale*

Infrastructure Updates

TRIUMF accelerator complex

ARIEL

ISAC-II
High energy

ISAC-I
Low and medium energy

500 MeV Cyclotron

Cyclotrons for medical Isotope production

Primary beam driver:
Cyclotron, 500 MeV, H-
Produces rare isotopes, neutrons and muons!

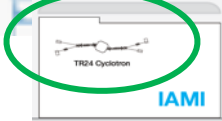
Isotope Separator and Accelerator facility - ISAC

Isotope Separator Online (ISOL) facility
ISAC-I: Normal conducting-linac, 0.15-1.5 MeV/u
ISAC-II: Superconducting-linac, 5-15 MeV/u

Advanced Rare Isotope Laboratory - ARIEL

Superconducting electron linac
30 MeV, 10 mA, cw

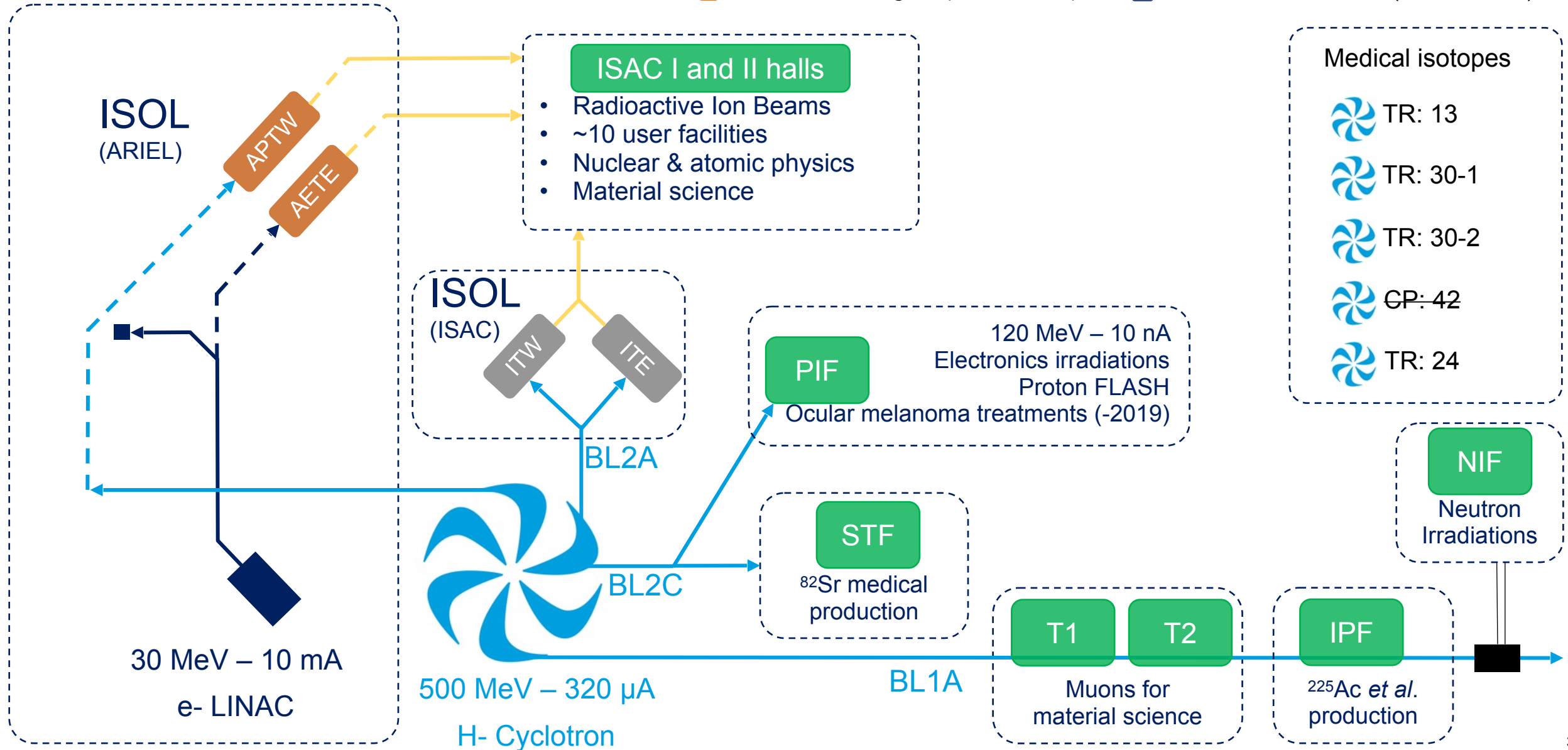
4 Cyclotrons for medical isotope production
(Including a TR24 in the Institute for advanced Medical Isotope – IAMI)



IAMI

Accelerators & Facilities

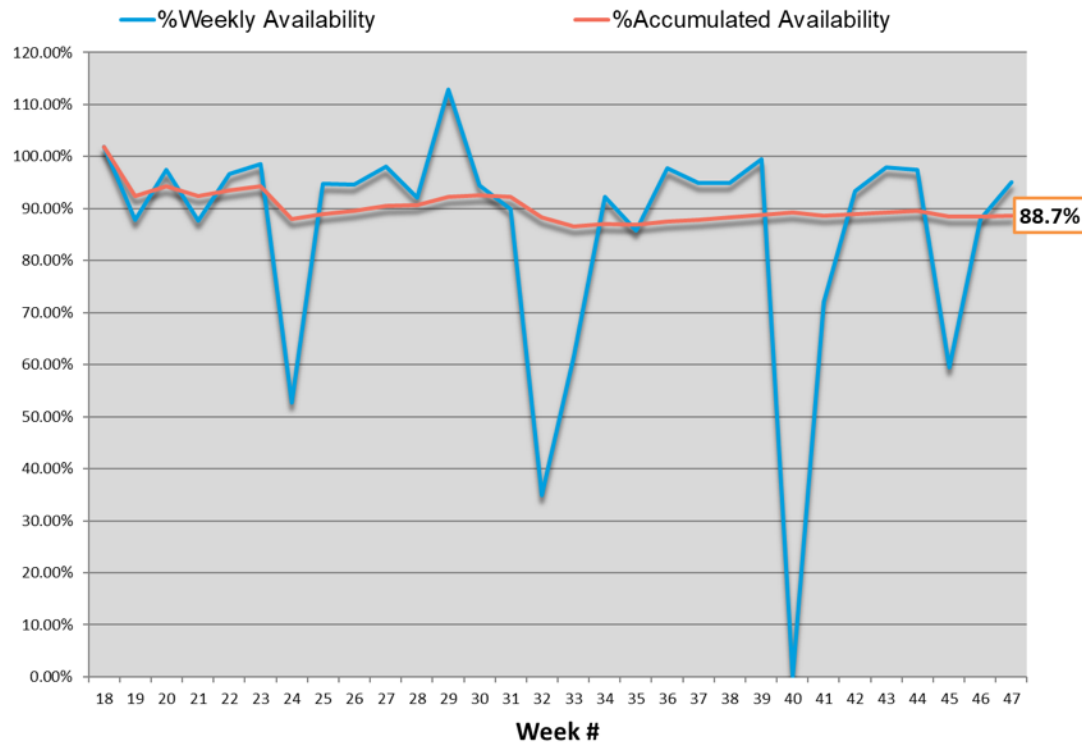
- User facilities
- ISAC ISOL targets (since 2000s)
- ARIEL ISOL targets (from ~2025)
- Cyclotron & beamlines (since ~1975)
- RIB lines
- E-linac and beamline (since ~2013)



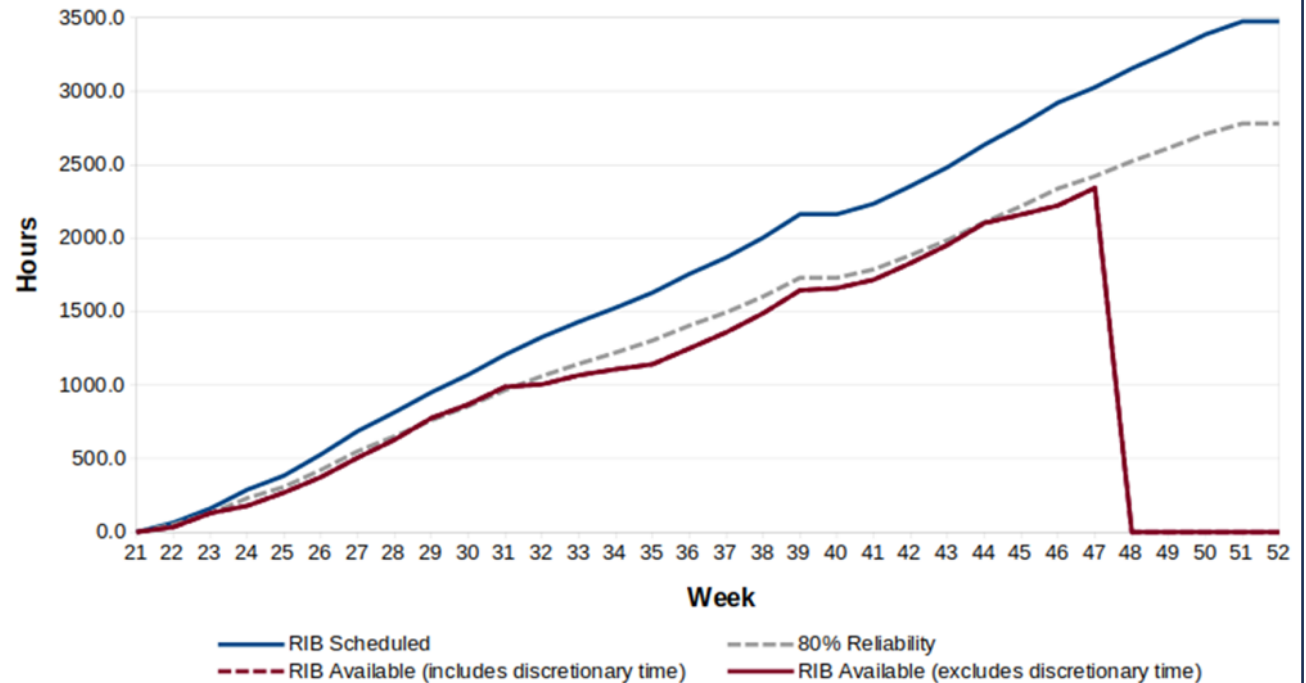
Operations

Thanks to Operations, Technical Groups, Service Groups, maintenance and SAS coordinators for delivering beam to users and maintaining infrastructure.

2023 Cyclotron Availability (%)

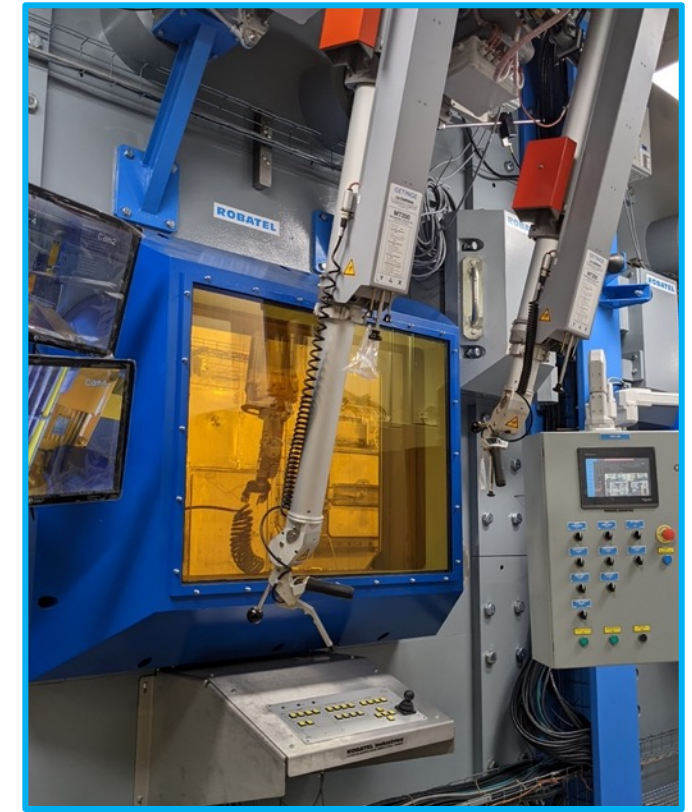


ISAC RIB Availability - Schedule 144 (2023) Experiments and Development



Progress on ARIEL - 2023

- Bottom-up cost and schedule review completed
- Beam extracted into BL4N
- Target module design complete
- Target hall shielding 85% design complete, 65% installation complete
- Hot cell (largest single capital invest) installation completed
- First RIB module dogleg completed



Target module design completion Hot cell completed



RIB module dogleg



BL4N vault installation



Target hall shielding



- TRIUMF and VECC (Kolkata) have had an active collaboration since 2008
- As part of the collaboration TRIUMF has completed and shipped three major deliverables to India in 2023
 - SRF QWR cryomodule – shipped January 2023
 - TISA Front end – prototype ARIEL target module – May 2023
 - RIE – radioactive ion extraction beamline – Nov. 2023



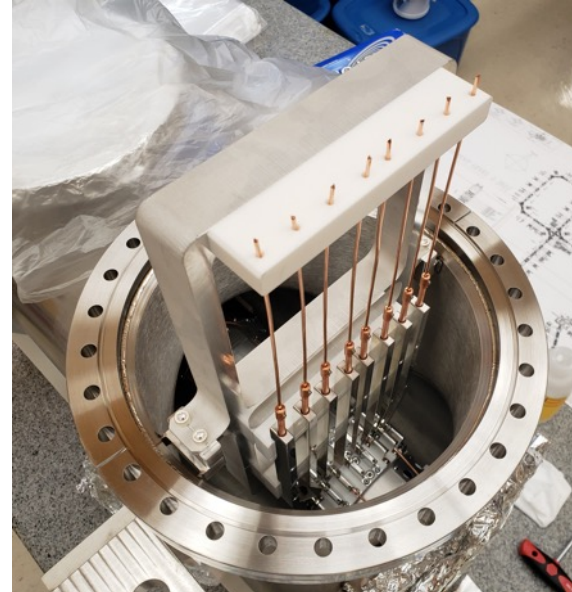
Quarter-Wave Resonator
Heavy Ion Cryomodule



TISA Front end



RIB module - HV feed lines



RIB beamline pre-separator



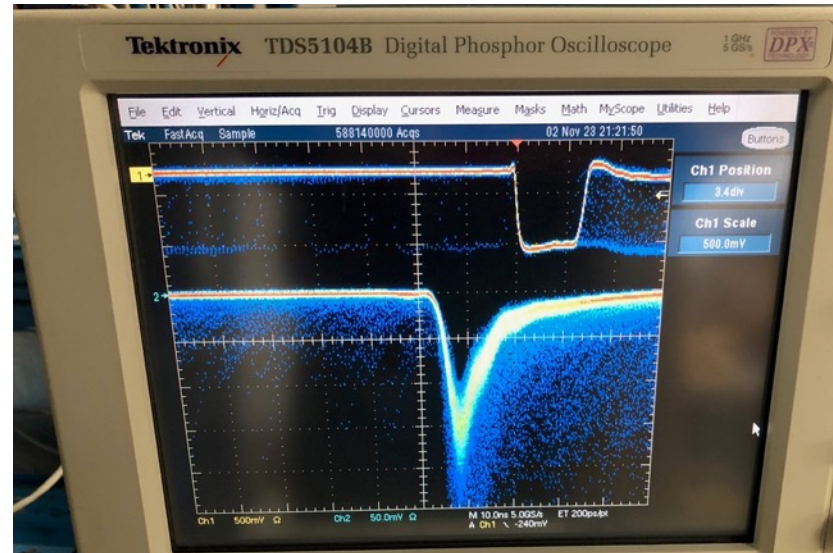
M9A has been safely delivered and is doing well !

First (muon ?) beam observed
Aug. 31, 2023 5:45 p.m.
... as verified by an
indisputable independent
witness; aka Nigel Smith



A genuine M9A
muon beam trace,
right now in M9A

... and the beam rate
achieved to date



... but in reality, it was a
positron beam that was
penetrating a closed gate
value at the end of the
beamline

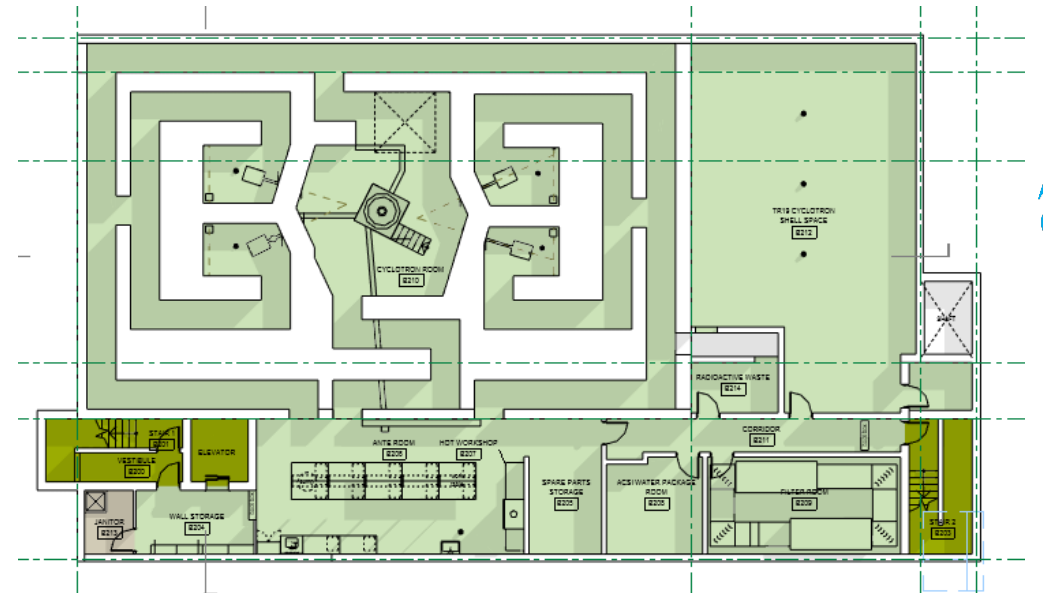
>1.2 E6 μ^+ /sec

>4 times the rate of M20 or M15*

*in its currently degraded (but soon to be rejuvenated) state

Institute for Advanced Medical Isotopes (IAMI)

- Construction of building complete, outfitting underway
- Initial suite of hot cells installed
- BC Provincial Health Authority will be placing 2nd cyclotron in facility; additional lab space to support expanding provincial PET program
- Additional funding secured to complete all facility spaces
- Operations expected to commence in 2025





Welcome to Science Week!



EMBARKING ON A BRIGHT JOURNEY