TRIUMF

User Services Newsletter

Volume 2 | No.2 December 2019

In this Issue:

A Message from the Deputy Director, Research – Reiner Kruecken

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Dear Friends and Colleagues,

In the last Newsletter we announced that the TRIUMF Five-Year Plan 2020-2025 has been supported by the Federal Government of Canada with an allocation of C$292.7M core operational funding, with C$25M of this funding a one-time supplement to help TRIUMF invest into site-wide infrastructure. This support for the long-term sustainability of TRIUMF is a significant vote of confidence for TRIUMF's vision and mission. Over the summer and fall we have consulted with you and a variety of other stakeholders on the priorities for the implementation of TRIUMF's Strategic Plan for 2020-2025 and beyond. With the available core funding and the supplement for infrastructure renewal, some rebalancing of the program was required, relative to the full ambitions laid out in the Five-Year Plan 2020-2025. Advancing our major platforms, ARIEL and IAMI, remains a central element of the plan, albeit with revised timelines.

In particular, it is not possible to deliver ARIEL by 2023 as originally planned while continuing science operation and carrying out the infrastructure investment initiative. Based on broad consultations, we decided to extend the ARIEL project timeline with a phased science implementation that will bring new science capabilities online in each stage. Simultaneously, we will maintain TRIUMF's science delivery and implement infrastructure improvements to retire significant operational risks. In the spring of 2020, the CANREB EBIS charge breeder and the new ARIEL low energy beam transport lines will start to deliver post-accelerated A>30 charge-bred rare isotope beams (RIBs) to experiments. The next stage will be the availability of two independent RIBs for experiments in 2023 with the completion of the ARIEL e-linac and associated electron target station and RIB production and delivery systems. The new beamline BL4N from the 520MeV cyclotron to the ARIEL proton target station, as well as the symbiotic medical isotope production station in the proton beam dump, will be completed in 2026. This will finalize the ARIEL-II CFI project and allow us to deliver three independent RIBs and to ramp up RIB production to an eventual 9000 hours per year.

The infrastructure improvements enabled by the C$25M supplement will allow us to carry out essential renewals of the 520MeV cyclotron and associated systems, refurbishments and

upgrades of the ISAC target modules and connected infrastructure, as well as critical RIB delivery systems. Investments into the Meson Hall infrastructure will enable us to prepare for the refurbishment of Beamline 1A, which supports the μSR program (which will see upgrades to the M15 and M9 channels, the latter being CFI funded), the Ultra Cold Neutron facility, the Proton and Neutron Irradiation Facilities, as well as medical isotope production. We will also consolidate the Driver and RIB control centers into a central TRIUMF Control Center over the next 5 years, and we will invest into upgrades of various software and cyber security systems to future proof our facility and processes. The IAMI construction is moving forward and commissioning is expected to be carried out through 2022.

Led by Marcello Pavan, who is heading the Academic and User Programs Office, we have begun to work on improving our processes for visitor registration and automatization of service provisions for users. Extensive consultations have been undertaken with stakeholders inside and outside the lab, with the aim of providing you with a better user experience in the new year. Your feedback along the way is essential for us and we encourage you to participate in forthcoming user surveys. For those users carrying out experiments at TRIUMF, please help us improve our service delivery by providing feedback upon completion of your experiments via the User Liaisons and through the exit surveys.

With this Newsletter, we are continuing to provide updates on the core programs across TRIUMF's whole multidisciplinary program, now also including news from the Life Sciences Program and the Proton and Neutron Irradiation Facilities. I hope you find these updates beneficial and would like to hear back from you on things you would like to hear more about in future newsletters or on any questions or concerns you might have (reinerk@triumf.ca).

ISAC Strategy Workshop Nov. 8th, 2019 - Jens Dilling and Chris Ruiz

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On November 8th a workshop on ISAC Strategy was held, organized by TRIUMF's Physical Science and Accelerator Divisions in conjunction with TUEC. The purpose of the meeting was to discuss the current state of ISAC Target Modules and future strategy for refurbishment, as well as other beam-line related issues that could result in operational improvements all in the context of the impact to the ISAC science program.

Currently there are two ISAC target modules in rotation – TM2 and TM4 – neither of which can sustain ≳40kV bias voltage when undergoing proton bombardment. This affects a large number of accelerated beam experiments requiring beams in the mass range A=17-30, where singly charged ions or molecules are required to deliver the highest beam intensities to experimental facilities. In addition, water leaks and material failure in target modules over the last few years have indicated a general degradation of the modules, necessitating urgent focus on instituting an imminent refurbishment strategy. This is also in light of the adjusted schedule for ARIEL and to allow achievement of the required ISAC functionality until ARIEL comes fully online.

About 60 users and local scientists attended the workshop which was also broadcast online. The morning session started with a presentation of the effects target module degradation has

on the experimental program before examining a few strawman beam schedule examples for 2020. This was followed by a detailed strategy proposal from the Targets & Ion Sources Group for module refurbishment and failure mitigation. A major part of that strategy is the addition of Safe Module Parking (SMP) and North Hot Cell (NHC) to the target hall infrastructure. Both major projects have been installed and commissioned. These two facilities represent a paradigm shift in target module investigation and refurbishment as they free up the South Hot Cell for continuous investigation/maintenance of target modules. Design adjustments of the Target Module that are required to implement a regular refurbishment of degrading components in the modules will also improve high-voltage performance. The Beam Dynamics & Delivery Groups also showed plans for RF Booster and low-energy beam line upgrades. Specifically, these upgrades would allow an increase of the effective booster voltage from 10kV to 16kV (upgradeable to 20kV) and an increase in RFQ capture efficiency in booster mode from ~40% to ~70 %. In addition, accelerator improvements that would help alleviate the strict design voltage requirements for ISAC target modules and allow some of the affected experiments to run were presented.

In the afternoon session there were discussions about beam-line distributions for the low-energy area in ISAC I for increased beam delivery capabilities during ARIEL. Moreover, ideas for a Fundamental Symmetry Program experimental hall in the repurposed ISAC II accelerator hall were discussed.

The broad conclusions of the workshop were that priority should be given to restoring target module HV functionality and improving target module reliability. A strategy exists that will restore HV capability of one target module (TM3) by 2021. This campaign will lay the foundation for ongoing refurbishment that will result in >2 modules being in rotation. Further it was agreed that the RF Booster and LEBT upgrades constitute a promising plan to de-risk the HV concerns on a 1.5 year timescale. The strategy is based on compelling evidence from target module post-mortems and detailed simulation results, revealing the problematic elements of the module design that need to be changed to improve HV stability/longevity. Details to this strategy can be found in a later contribution in this newsletter.

At the workshop users expressed desire to achieve greater reliability in 2020, so before the technical improvements take effect, though not at the full expense of a regular schedule: consensus was achieved that some kind of hybrid schedule could be enacted in 2020. This could consist of periods of high reliability, with predictable, identical target & ion source combinations (on-line target module and hot spare) separated by blocks of no beam, then a period of regular schedule with broader flexibility for target & ion source combinations considered, though with commensurate greater risk of disruptions. We will be working with the User Group to come up with a reasonable compromise to achieve this and enable a high profile and competitive science program for the ISAC facility.

Presentations for the open workshop can be found here:
https://meetings.triumf.ca/indico/event/88/

Nuclear Physics with Isotope Beams – *Martin Alcorta*

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We have rolled out the new ISAC exit survey on the Office 365 platform, with 11 responses so far for this year. The responses have been overwhelmingly positive, with several comments praising the extra efforts of beam delivery and operations. However, there were some criticisms, namely focusing on the visitor onboarding process and on the unreliable status of the target modules. The latter was addressed during the target and module workshop which took place on November 8th and is discussed in the workshop article above. The visitor system is going to undergo a significant overhaul, as discussed in the Deputy Director's message.

We are also happy to report that there were several issues addressed from previous years survey comment, specifically related to the communication of downtime events. The Accelerator Operations department worked in 2019 to clarify roles and responsibilities as they relate to the communication of beam delivery interruptions to end-users. By establishing a department-wide approach to communication, the department hopes to improve the end-user experience by providing consistency of service across site. To date there have been no further complaints on this issue, which is a sign of improvement.

Science Technology - *Thomas Lindner*

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The goal of the Science Technology Department is to support the user community in bringing their projects to reality by providing technical resources for the design, construction, and operation of experiments and other apparatus.

Recently the Science Technology department has helped develop new infrastructure at TRIUMF for research on vacuum ultra-violet (VUV) photon detection solutions. Single photon detectors are widely used for detecting the light produced by a wide range of particles going through or stopping within materials. The most common process for generating light is scintillation, where the detectable light from most scintillating materials is above 350nm, since most of the light emitted below that wavelength is be re-absorbed. Important exceptions are the noble gases, which emit scintillation photons in the vacuum ultra-violet range (100-200nm), peaking at 175nm for Xenon, 157nm for Krypton, 128nm for Argon, and even lower for Neon and Helium. Single photon detectors capable of detecting scintillation photons (aided by wavelength shifting materials in Argon) from Xenon and Argon are at the heart of many experiments searching for dark matter interactions and neutrino-less double beta decays. TRIUMF is playing a major role in developing solutions for the detection of VUV scintillation photons.

A new set of equipment for VUV light detection has been installed at TRIUMF with funding from the Canadian Foundation For Innovation (CFI), the McDonald Institute, and the Natural Science and Engineering Research Council (NSERC), with support from the Science Technology department. The new Photon Laboratory is nearing completion and will house two setups dedicated to the development of single photon sensor and VUV materials: the VUV Reflectivity, Absorption and Efficiency characterization setup (VRAE); and the Light Emission and Injection Microscopy (LIEM) setup. The VRAE setup includes a tunable continuous VUV light source, a sample stage that be cooled with liquid Nitrogen rotated along one axis and translated along one axis, and a VUV sensitive PMT on a rotating arm for detecting the light transmitted through or reflected by the sample. This setup is currently being used for assessing the performance of VUV Silicon Photo-multipliers produced by Fondazione Brunno Kessler (FBK) in Italy and Hamamatsu Photonics in Japan. For instance, the setup measured the FBK SiPM as having a 24% photon detection efficiency at 175nm.

The LIEM setup will be completed by the end of March 2020. It is meant to study the response of SiPM in details by using mono-chromatic pulsed light focused through a microscope. The light emitted by the SiPM is a major nuisance for a single photon sensor and will also be characterized
using the LIEM setup. The setup is expected to enable TRIUMF to play a major role in the design of next generation single photon detectors. Indeed, TRIUMF is collaborating with the Université de Sherbrooke in Quebec on the development of the Light to Digital Converter (LDC), also called 3D integrated digital SiPM. It is an assembly of at least 2 silicon chips, a photo-detector chip and an electronics chip, with connections every 50 um or so. The LDC promises significantly higher performance compared to the conventional analog SiPM technology, in terms of timing resolution
and ease of integration. TRIUMF is investigating a back-illuminated concept for the photo-detector chip that would enable achieving photo-detection efficiency better than 50% rom VUV to Near-Infrared. Should they perform as expected back-illuminated LDC would find a wide range of applications in subatomic physics and beyond.

Further details on the different services provided by the department and the procedure for requesting assistance is provided on our website: http://www.triumf.ca/science-technology.

Centre for Material and Molecular Science - *Iain McKenzie*

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We are currently accepting proposals for evaluation at the January 2020 Molecular and Materials Science Experiment Evaluation Committee (MMS-EEC). The deadline for submission is Wednesday, December 11, 2019. Information about submitting a proposal can be found at https://www.triumf.ca/research-program/planning-experiments/how-submit-proposal/mms-eec-process. The terms of reference of the MMS-EEC have been updated to give greater clarity about the evaluation process and the process for rapid access.

Recent and ongoing developments at the CMMS:

1) The installation of the new radiation-resistant quadrupole magnet doublet and the front-end of the M9 beam line has been delayed until the 2021 winter shutdown. This means that beam delivery to M9A is anticipated at the beginning of the summer 2021 beam period and this will be followed by commissioning of the beam line and the new, dedicated 3T spectrometer with SiPM detectors. User operations are anticipated in the fall 2021 beam schedule. The M9A surface muon beam line and spectrometer will be optimized for rapid sample characterization with user-friendly operation. The construction of the high-momentum M9H beam line is proceeding with commissioning anticipated in 2023 with user operation commencing shortly thereafter.

2) SiPM detector development for μSR has reached a milestone with the successful beam testing of muon and positron counters for the 3T spectrometer project. Timing resolution of the muon counters is 70 ps and the timing resolution of the entire muon start – positron stop sequence is 210 ps, for the rather large positron detectors used in the 3T spectrometer. The SiPM configurations and front-end electronics used to produce this outstanding result will form the basis of systematically upgrading all the μSR spectrometers in future years.

3) Many experiments on the DR spectrometer require zero magnetic field, which is difficult to produce in a superconducting magnet, especially after large magnetic fields have been applied. Starting in 2020 we will group all the zero field measurements on the DR together requiring B < 30 mG at the beginning of the beam period. Please indicate that you need precise zero field measurements on the DR when you are submitting your beam request.

4) There will be reduced availability of βNMR in 2020 due to the delayed startup of ISAC. This year, as in 2018 and 2019, we are anticipating approximately four weeks of 8Li βNMR, instead of the usual five weeks, and one week of 31Mg βNMR. The delayed startup is due to personnel being shifted to tasks related to the completion of the Advanced Rare IsotopE Laboratory (ARIEL). ARIEL is TRIUMF's flagship multidisciplinary research facility and will broaden Canada's research capabilities in particle physics, nuclear physics, nuclear medicine, and materials science by tripling TRIUMF's output of rare isotopes for research upon completion in 2024. The βNMR facility will see an increase in beam time in the coming years, eventually reaching 15 weeks of beam per year upon the completion of ARIEL.

5) A new βNMR spectrometer is being constructed that will have in-sample-plane magnetic fields of up to 0.2 T and temperature down to 300 mK. The first stage, which involved rebuilding the βNQR beam line to with new electrostatic optics and beam tuning diagnostics, was completed in the winter 2019 shutdown. The second stage, which will involve extension of the beam line past βNQR and installation of the mid-field magnet, is planned for fall 2019 with commissioning in summer 2020.

6) We have been developing the high temperature capabilities of the βNMR facility. There is a cryo-oven on βNQR (10 to 450 K) that successfully ran in 2019. It is currently not

compatible with using the beam spot cameras, so should only be used for high temperatures, or when one has samples with large lateral dimensions. Modifications to increase the maximum operating temperature of the βNMR spectrometer to 400 K are ongoing. Offline tests of the equipment will be performed during the winter shutdown and commissioning will take place in the summer 2020 beam time.

We ask that all users fill in the user survey at for every experiment that they complete. This is the best way for us to track the problems that have affected your experiments and improve the facility. We are grateful to our users who have filled in the survey. Issues that have been highlighted include problems with temperature controllers and the auto-run program. CMMS staff have been working on these issues. To obtain the link to the CMMS exit survey, please contact Iain McKenzie at iainmckenzie@triumf.ca.

M11 Beam Testing – *Isabel Trigger*

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The detector test facility at M11 had an active summer. In June it was used for two weeks by the students attending the GRIDS-2019 detector school at TRIUMF. Each group of students had the opportunity to learn about time of flight and dE/dx methods for distinguishing and characterizing electrons, muons and pions passing through plastic scintillators and stopping in the venerable “MINA" sodium iodide crystal.

In August and September M11 returned to its primary mission as a detector test facility: a team of T2K/HyperK researchers from TRIUMF and the University of Winnipeg are building an aerogel ring-imaging Cherenkov detector for the EMPHATIC spectrometer. EMPHATIC will measure hadron production at FermiLab, and the aerogel RICH will provide pion/kaon particle ID up to about 7 GeV. The M11 beam, with its mixture of particle species, is a great testing ground for the aerogel detector. Users with proposals for M11 are invited to submit them to an upcoming Subatomic EEC.

Please contact Isabel Trigger for the exit survey link for users completing their beam time.

Proton and Neutron Irradiation Facilities (PIF & NIF) – *Camille Belanger-Champagne*

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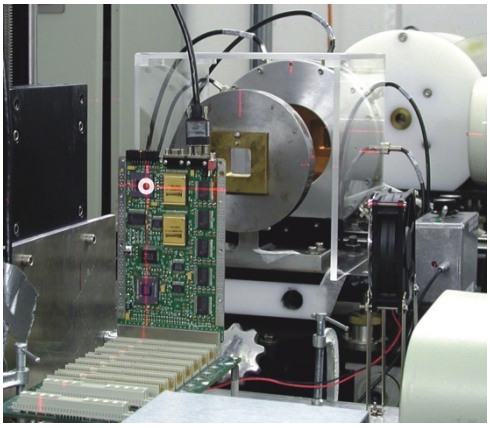
Since 1995, the Proton and Neutron Irradiation Facilities (PIF & NIF) at TRIUMF have developed multiple low-intensity beam lines for radiation testing of electronics and materials with proton and neutron beams. Higher-energy protons are available on BL1B (480 and 355 MeV) while lower-energy protons are available on BL2C (105 and 63 MeV extracted beams, other energies available with degraders). Neutrons with an atmospheric-like energy spectrum are available at the TNF facility, located at the end of BL1A, or by converting the proton beams of BL1B and BL2C into neutron beams.

Each year about 195 users from about 45 companies, laboratories, or universities test electronics or materials at PIF & NIF. Commercial users buy beam time by the hour for component testing and qualification. Limited hours are also made available to researchers for studies of radiation effects when formally approved by the TRIUMF Experiments Evaluation Committee.



More information about PIF & NIF, including detailed beam specifications, availability, and scheduling, is available at: https://www.triumf.ca/pif-nif.

Life Sciences – *Cornelia Hoehr*

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The Life Sciences Division at TRIUMF pursues both fundamental and applied research and development under three core pillars: studies and applications with ions beams, nuclear chemistry, and the application of isotopes to understand life at the molecular level. To achieve this goal, the division of Life Sciences relies on all accelerators at TRIUMF – from 13 to 500 MeV, including the emerging electron linac, all of which hold potential as key drivers for research in all core areas. Together with our radiochemistry and beta NMR laboratories, the division maintains cutting-edge facilities and expertise in research and development of radioisotopes and radiopharmaceuticals for use in nuclear medicine, radiotherapy and the broader life sciences. Experiments needing access of the Life Sciences resources are reviewed via the Life Sciences Projects Evaluation Committee (LSPEC): https://www.triumf.ca/research-program/planning-experiments/how-submit-proposal/lspec-process

Medical Isotopes

With access to the world's broadest range of cyclotron energies, from 13 to 500 MeV, TRIUMF Life Science produces a diverse mix of radioisotopes using gas, liquid and solid targets. The TR13 cyclotron uses any one of gas, liquid or solid targets to produce a variety of radioisotopes, including our staples - carbon-11 and fluorine-18 – or a wide variety of emerging metallic radionuclides, including zirconium-89, gallium-68, copper-64 and scandium-44. New interests include antimony-119 and mercury-197. At higher energies, the main 500 MeV cyclotron is used with solid targets to produce a variety of experimental metal medical isotopes, including isotopes of titanium, actinium, bismuth and radium.

For radiochemistry research, TRIUMF Life Science includes a MHESA lab (Meson Hall Extension Service Annex) with four state-of-the-art hot cells, or radiation-shielded, robotic-arm accessed chemistry stations. Each one-meter-cubed hot cell is surrounded on all sides by tons of radiation-shielding lead bricks, with a lead-shielded door with a thick leaded glass window that provides a view of the interior. Scientists access a hot cell's interior using a sophisticated robotic arm that enables them to manipulate glassware and other tools for conducting detailed

radiochemical experiments and manipulating the manufacturing systems. This includes developing the purification chemistry for potential new radioisotopes. Engineering support for automisation of different remote activities can be provided.

For the production of radiopharmaceuticals for clinical and pre-clinical research use in humans, TRIUMF Life Science operates Health Canada-approved certified Good Manufacturing Practice (cGMP) labs. These cGMP labs are akin to clean rooms and use specialized commercial radiochemistry synthesis systems that include software and hardware compliance and tracking features. This ensures the patient safety of all the TRIUMF-produced medical isotopes, including carbon-11 and fluorine-18.

Life Science experiments with ion beams

As TRIUMF operated the only proton therapy facility in Canada, experiments and studies with a clinical (74 MeV) proton beam can be conducted at the PIF/NIF facility at TRIUMF (https://www.triumf.ca/pif-nif). Beam delivery is passive with beam shaping done in the treatment room to produce beams of different sizes (up to 25 mm diameter) and energy spreads. Typical dose rates in the treatment volume at isocentre are ~ 0.14Gy/s.

In addition, for medicinal chemistry, chemistry and biochemistry research, TRIUMF operates the ultrasensitive Nuclear Magnetic Resonance (NMR) facility, where experiments are performed using radioactive ions which decay via emission of a beta particle. With a beta-decay NMR program (known as bio-betaNMR) embedded within TRIUMF's larger CMMS initative, the Life Sciences Division has developed technology required for performing experiments in liquid samples, that allows measurements of structure and dynamics of biomolecules in solutions. Currently, routine experiments in liquids are performed using ^{31}Mg and ^{8}Li beams, however, in the near future several additional isotopes will be added to this list, including Ac, Cu and Zn.

Beam Schedule Update - *Chris Ruiz*

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We are currently over half-way through Schedule 137, which commenced on October 8th after the mini shutdown. At ISAC, Schedule 137 consists of 10 ½ weeks of running, utilizing 5 separate target blocks, the first of which was populated with uranium carbide and a surface ion source for Life Sciences experiments at βNMR . After that, a block of tantalum target with surface ion source was scheduled for regular MMS βNMR experiments, then a uranium carbide with surface ionization for TITAN, GRIFFIN and OSAKA experiments. Originally scheduled following that was a high-power silicon carbide target with FEBIAD ion source, for ^{8}He beam to the IRIS facility. During startup some technical issues forced a rearrangement of the beam schedule. Instead GRIFFIN ran earlier than originally scheduled with neutron-rich magnesium beams, and as of the date of this newsletter the IRIS experiment is running. Following the IRIS experiment, several shifts have been dedicated to high voltage testing for TM2, as that will be

the last time it is run in 2019. These tests are to fully explore the bias voltage limitations of the target module now that it has a refurbished source tray, including finding the envelope of sustainable target bias at different proton beam intensities.

Finally, TM4 will run yet again as the last target of the year, with a uranium carbide and surface ion source for two shorter experiments: TRILIS development of actinium beam then delivery of $^{230-234}$Ac to the polarizer beam line for beam development. The final day of the schedule will be dedicated also to HV tests for TM4 in the same manner as for TM2.

Notes on TM failure in Schedule 136

This summer TM4 developed a water leak after a new source tray had been installed shortly before it was to be prepared to go online with a uranium carbide target for a three-week block starting August 6th. The prospect was faced of losing the three-week block entirely, which consisted of a long GRIFFIN experiment with neutron-rich potassium beams, a ^{7}Be implantation, and a ^{7}Be experiment at DRAGON. This was because the planned repair – an indium gasket to seal the water leak – was deemed too risky to schedule for the remainder of the block without additional tests with the gasket. Instead, the preceding tantalum target block was extended by one week to allow the GRIFFIN experiment to take discretionary beam time, since their experimental team was already onsite. Then, after a 1 ½ week break, the following zirconium carbide block was brought forward by a week, and with a little adjustment allowed ^{7}Be to be delivered to both the implantation and the DRAGON experiments. Thus we were able to minimize the disruption to the science output while allowing the critical repair to take place. This was possible because of the ability of ZrC targets to produce similar intensity of ^{7}Be as UCx targets as the production stems mainly from C in the target. Utilizing this we can go forward to schedule ^{7}Be beams from either target material.

TRIUMF would like to extend apologies for any inconvenience caused to users during this schedule adjustment and hopes that the efforts made by the technical teams to allow these adjustments minimized the impact somewhat.

Target and Ion-Source Updates – *Carla Babcock and Alex Gottberg*

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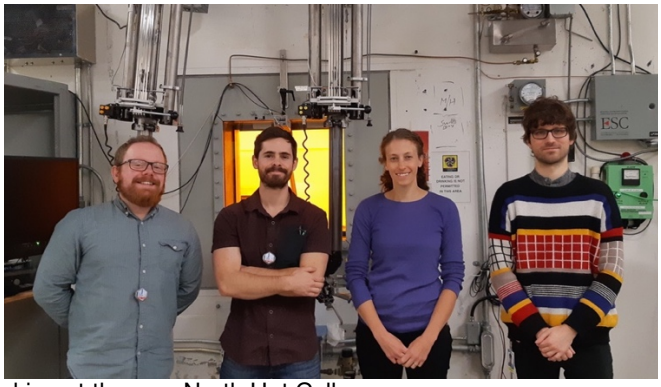
This year several long standing infrastructure projects have been completed by the Targets and Ion Sources Department, which not only make ISAC more robust, but also contribute to our long-term plans for refurbishment. The North Hot Cell has been completed, giving us our second ISAC target hot cell, which will be used for all routine target exchanges. This frees up the South Hot Cell for more complex jobs. In addition, Safe Module Parking has been implemented, which provides a space for emergency module landing. This means the South Hot Cell doesn't have to act in this capacity anymore and can be occupied for long periods of time required to carry out complex repair projects. This finally paves the way for a sustainable ISAC long term plan to refurbish the target modules and provide more reliable beam operation, especially at higher extraction fields.

Left: Chad Fisher (Senior Hot Cell Specialist) working at the new North Hot Cell
Right: Dedicated TM3 team: Matt Kettle, Sam McEwen, Carla Babcock, Alexander Shkuratoff in front of the ISAC South Hot Cell

To make full use of this new infrastructure, a team has been put together to work (see picture above) specifically on ISAC projects. This team's first project will be the refurbishment of TM3 in order to bring it back into operation and up to high voltage operation (aiming at 60 kV) for May 2021. This involves removing the old service tray, which is broken, and replacing it with a new design that has undergone systematic high voltage simulations. This will be the first time an ISAC target module service tray has ever been replaced and performing this operation on TM3 will serve as a test case for the refurbishment of TM2 and TM4 in the future.

These refurbishment campaigns are vital to the reliability of ISAC. As many users know, there have been a few issues this year related to high voltage performance and water leaks, two of the main sources of reduced performance at ISAC. There was a problem with the TM4 water connections as a result of radiation-enhanced corrosion. The Targets and Ion Sources and Remote Handling groups worked hard to identify this issue and come up with a working solution, which has been successfully sealing the leaks for the past two runs. This solution is, however, untested and we are unsure how long it will last. Additionally, several other connections have operated for the same time in identical conditions. In order to minimize the impact of any further water leaks, the testing of alternative water connectors meant for the TM3 refurbishment has been accelerated. These connectors could provide a remotely installable backup in the case of a serious failure of the current solution.

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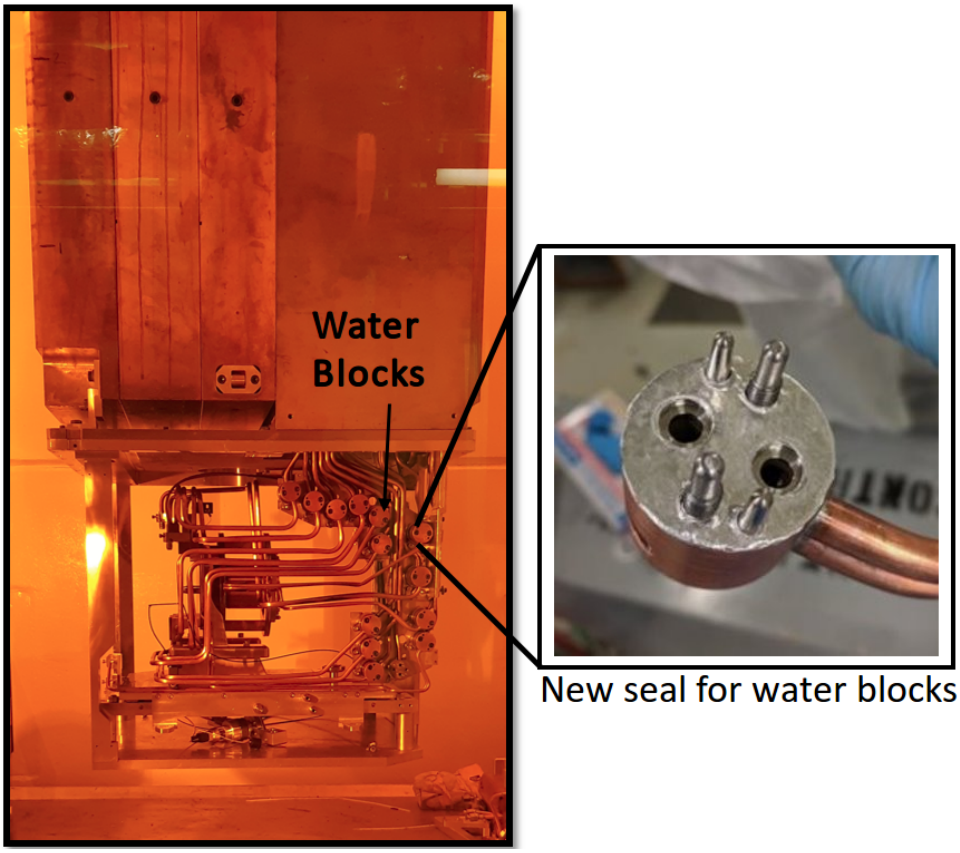

New seal for water blocks

In order to address some of these issues, an ISAC strategy workshop was conducted on November 8, 2019 to inform the users of the current plans for ISAC and to solicit feedback from the users on what developments should be prioritized. This workshop was very productive and encouraged open discussion between various groups on development ideas. The feedback from users indicated that the highest priority was the mitigation of HV issues, a priority which is in line with the strategy that TRIUMF has planned, beginning with TM3 refurbishment and upgrades to the RF booster. The next priorities were reliability and more beams. An alternative schedule was presented with the aim of prioritizing reliable operation for the following year, and the details of this are still under discussion. See the contribution above "ISAC Strategy Workshop – November 8th 2019" for more details.

Despite a busy online schedule 137, several beams could be improved, and systematic yield measurements and high-voltage tests are contributing to a better understanding of general target and ion sources performance. The proton beam intensity on UC_x targets has been gradually increased and performance is promising. There have been extended periods of 15uA and 20uA proton beam operation on the last target in schedule 137. At TRILIS a resonant ionization scheme for Cr was developed, tested online as part of a MSc. thesis and used to deliver beams for MR-TOF mass measurements as well as in preparation for GRIFFIN experiments. Here laser ionized Cr isotopes were used as mass markers for precise mass separator tuning to the sought-after K isobars.

Volume 2 | No.2 December 2019

TRIUMF Users Group Update – *Gwen Grinyer*

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What are TUG and TUEC and how do you become a member?

The TRIUMF Users Group (TUG) is a formal organization of scientists and engineers whose professional activities have special interest in the use of the TRIUMF facility and/or TRIUMF resources. Becoming a member of the TRIUMF users group is free and is open to all TRIUMF users in all TRIUMF disciplines. We encourage everyone who is not yet a TUG member (including students and postdocs!) to please sign up via the TUG mailing list at:

http://lists.triumf.ca/mailman/listinfo/triumf-user

The TRIUMF Users Executive Committee (TUEC) for 2019, as elected by the TUG membership, were:

- Gwen Grinyer, University of Regina, Chair
- Caterina Ramogida, Simon Fraser University, Chair elect
- Ania Kwiatkowski, TRIUMF, Past Chair
- Christian Diget, University of York (UK), Member
- Sarah Dunsiger, TRIUMF, Member
- Alex Gottberg, TRIUMF, Member
- Blair Jamieson, University of Winnipeg, Member
- Marcello Pavan, TRIUMF, Liaison

and the incoming Executive for 2020 will be:

- Caterina Ramogida, Simon Fraser University, Chair
- Gerald Gwinner, University of Regina, Chair Elect
- Gwen Grinyer, University of Regina, Past Chair
- Maxime Brodeur, Notre Dame University (USA), Member
- Sarah Dunsiger, TRIUMF, Member
- Blair Jamieson, University of Winnipeg, Member
- Isabel Trigger, TRIUMF, Member
- Marcello Pavan, TRIUMF, Liaison

TUG AGM 2019 and Student Prize winners

We would like to thank everyone for their participation in the TUG annual general meeting that was held on August 22, 2019 as part of Science Week. We received lots of your feedback and TUEC has, and will continue to, engage in fruitful discussions with management on issues affecting the user's community. We also want to thank all of the students and postdocs who made this year's poster slam a big success.

Join us in congratulating our student winners who have received prize money generously donated by the ALDs of the Physical Sciences, Life Sciences, Accelerator and Engineering Divisions:

- **Kilian Dietrich**, MSc student, TRIUMF/U. Heidelberg
    - Oral prize ($400) "New electron gun for the TITAN-EBIT"
- **Darij Starko**, PhD student, TRIUMF/York U.
    - 1st poster prize ($400) "Silicon Photomultiplier-based scintillators for ALPHA-g"
- **Brooke McNeil**, Undergraduate Coop student, TRIUMF
    - 2nd poster prize ($200) "Production and application of the ^{203}Pb/^{212}Pb theranostic pair"

Notes from TUEC

The Executive Committee has been working hard this year on several aspects aimed to help improve the TRIUMF user's experience including:

- Organizing the TUG Annual General Meeting held every summer during Science Week
- Participating in Advisory Committee on TRIUMF (ACOT) meetings held biannually
- Assisting the organizers and collecting feedback for the ISAC Strategy Workshop (November 8)
- Working with the new User's office to improve access and streamline the visitor process
- Regular TUEC meetings and improving email communication (minutes of TUEC meetings)
- Regular meetings with management to discuss issues affecting users and solutions
- Improving and updating the Charter and By Laws of the TRIUMF User's Group
- Being the voice of all users on any and all user-related issues

For any TRIUMF user-related questions, concerns or suggestions please feel free to contact TUEC at any time by sending an email to tug@triumf.ca. We want to hear from you!

Thank you to our outgoing TUEC members

We sincerely wish to thank Ania Kwiatkowski for all of her hard work and dedication to serving our users community over the past three years in her roles as TUEC Chair Elect (2017), Chair (2018), and Past Chair (2019). We also want to thank outgoing TUEC members Christian Diget and Alex Gottberg for their two years of service as members of TUEC.

END

If you have any questions or concerns regarding the contents of this newsletter, please contact Marcello Pavan at marcello@triumf.ca