

2024/02/08 EAC/SEF

# Research Updates

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Director of Research



# Planned Discussion Items

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- Professional Services model for additional labour
- Research Risk plans
- PMO updates
- Scientific Services updates

# Professional services model

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- Requests to grow the EIT program and other services constrained by SNOLAB MSI budget.
- Previously hired additional staff paid for by other funding sources
- Costs were bare salary+benefits, neglecting additional costs
- Moving to an hourly rate as a professional services model to make the program growth sustainable
- Rate based on full costs to employ a competent professional in the staff category

# Research Risk plans

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- New [National Security Guidelines for Research Partnerships](#) and [Policy on Sensitive Technology Research and Affiliations of Concern](#) released
- Plan to implement a response in the Project Lifecycle Process
- Considering a requiring the [Research Risk Assessment Form](#) for all projects
  - One assessment form per collaboration/project
- We will consider guidance on, e.g., how to vet changes in collaboration membership; how often to update the form; risks to consider
- Early in the process, so open to feedback



# Project Management Office Updates



- Project Life Cycle Management
- Experiment Advisory Committee – Terms of Reference
- Guidance for new Equity, Diversity, and Inclusion Review Charge Questions
- Project Review Report Template
- Continue to work on internal project oversight and control

		<b>Project Life Cycle Management</b>	
Document Number: SL-SCI-RES-60-001-P		Revision Number: 02	
Document Owner: Director of Research			
Reviewer:			
Name: Jeter Hall	Signature: <approval on file>	Date: 2023-08-22	
Approval Authority: Director			
Name: Jodi Cool			

		<b>EXPERIMENT ADVISORY COMMITTEE – TERMS OF REFERENCE</b>	
Document Number: SL-SCI-RES-60-002-P		Revision Number: 02	
Document Owner: Executive Director			

**1.0 PURPOSE**  
This procedure provides clear mechanisms to management, s

**2.0 SCOPE**  
This procedure approved exper SNOLAB intern

**1.0 PURPOSE**  
The SNOLAB Experiment Advisory Committee (EAC) is an international peer review committee that advises the Executive Director and Executive Director Office (EDO) on the science program that is undertaken at the SNOLAB deep underground facility. The Committee performs two roles: providing advice during the initial assessment of experiments that are proposed for location at SNOLAB; and providing advice and

		<b>SNOLAB PROJECT LIFECYCLE MANAGEMENT</b>	
		<b>Guidance for new Equity, Diversity, and Inclusion Review Charge Questions</b>	
Document Number: SL-SCI-RES-60-001-F29		Revision Number: 00	
Document Owner: Director of Research			

**1.0 INTRODUCTION**

SNOLAB strives to foster an environment where everyone feels safe, comfortable and empowered. To achieve this, SNOLAB assembled an Equity, Diversity, and Inclusion (EDI) task force comprising of various members of SNOLAB staff. In 2021, an Action Plan was created with a variety of deliverables which have either been fully implemented or is in the process of being implemented. In 2022, the SNOLAB Director of Projects began embedding within its project lifecycle reviews a charge question set to establish whether experiments were satisfactorily applying EDI measures within their collaborations.

SNOLAB Project Reviews - EDI Charge Question: "Does the project have a suitable code of conduct and EDI strategy aligned with SNOLAB requirements and is there data on the performance of the EDI strategy."

# Project Reviews Since Last EAC (13)

<i>Date</i>	<i>Project</i>	<i>Review</i>
December 8, 2023	SuperCDMS	PLC Mini IRR
November 1, 2023	SuperCDMS	IRR 3B (OVC, cryocoolers, Lower Mu Metal Shield)
October 19 & 20, 2023	SuperCDMS	EHS Benchmarking Activity
August 23 & 24, 2023	nEXO	Facility Subsystems CoDR - Hybrid
August 21 & 22, 2023	nEXO	Outer Detector CoDR - Hybrid
August 20 & 27, 2023	SuperCDMS	HAZOP (full cryogenic system)
Jul 19, 2023	SNO+ Te	GW3 ORR (test batch)
May 12, 2023	SuperCDMS	GW3 IRR (Base Shield)
May 11, 2023	SuperCDMS	(RRA follow up) Part 2
April 25, 2023	SNO+ Te	SNO+ electronic review
April 18, 2023	SNO+ Te	SNO+ TeA chemical handling & safety review
April 11, 2023	SNO+ Te - AV fill	GW3 ORR (Bis MSB addition)
April 3-5, 2023	PICO-500L	GW1A PDR

# Project reviews planned for this year

<i>Date</i>	<i>Project</i>	<i>Review</i>
FEB 2024	SuperCDMS	GW3 IRR# 4
MAR 2024	PICO-500	TDR
MAR 2024	MPC Breaker	IRR
MAR 2024	Information Security	Surface Wi-Fi Deployment TDR
SPRING 2024	DEAP-3600 Upgrades	GW3 ORR (gas cooling)
SPRING 2024	SNO+ Te	Director's Review
JUL 2024	nEXO	Project-Director's Review/GW-1
TBD 2024	OSCURA	PDR (GW-1A)
TBD 2024	SBC	TDR



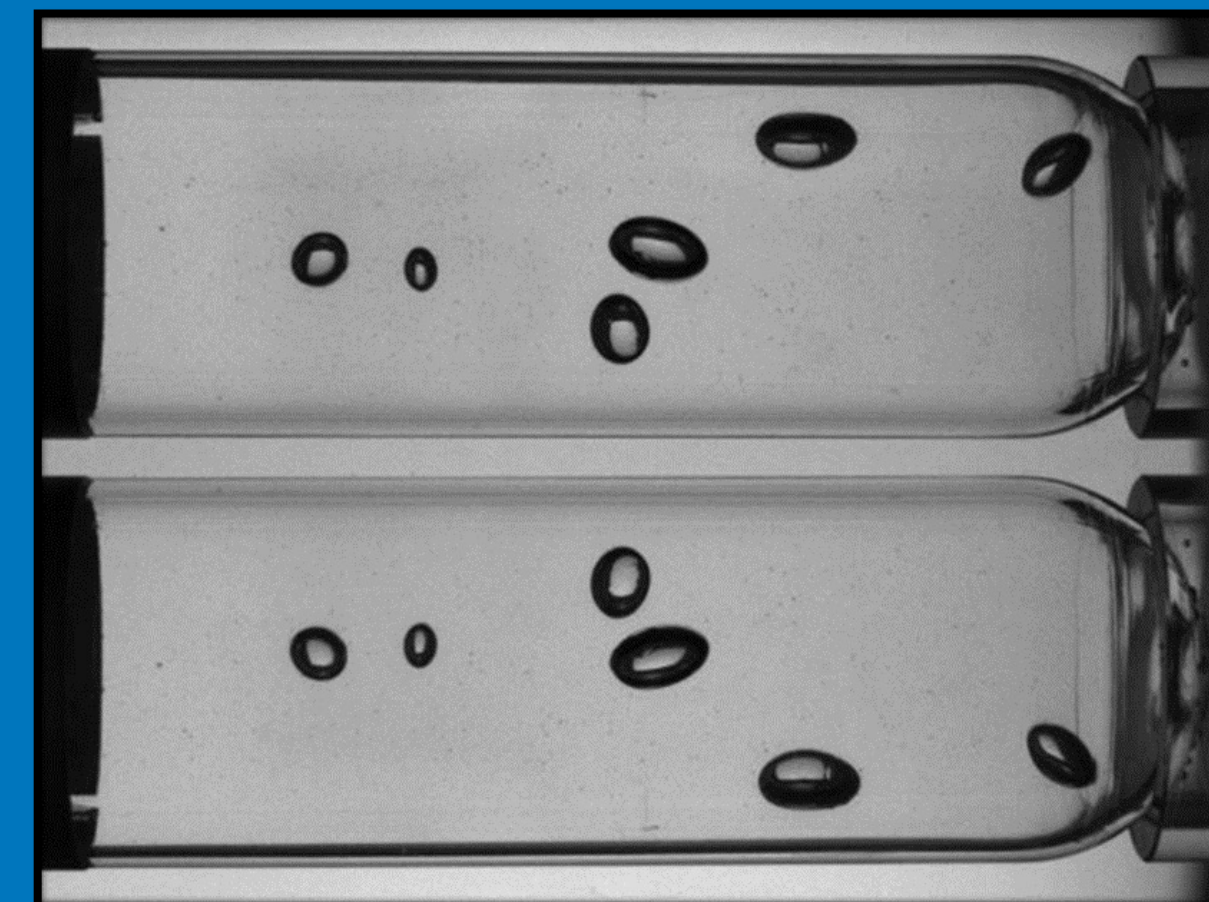
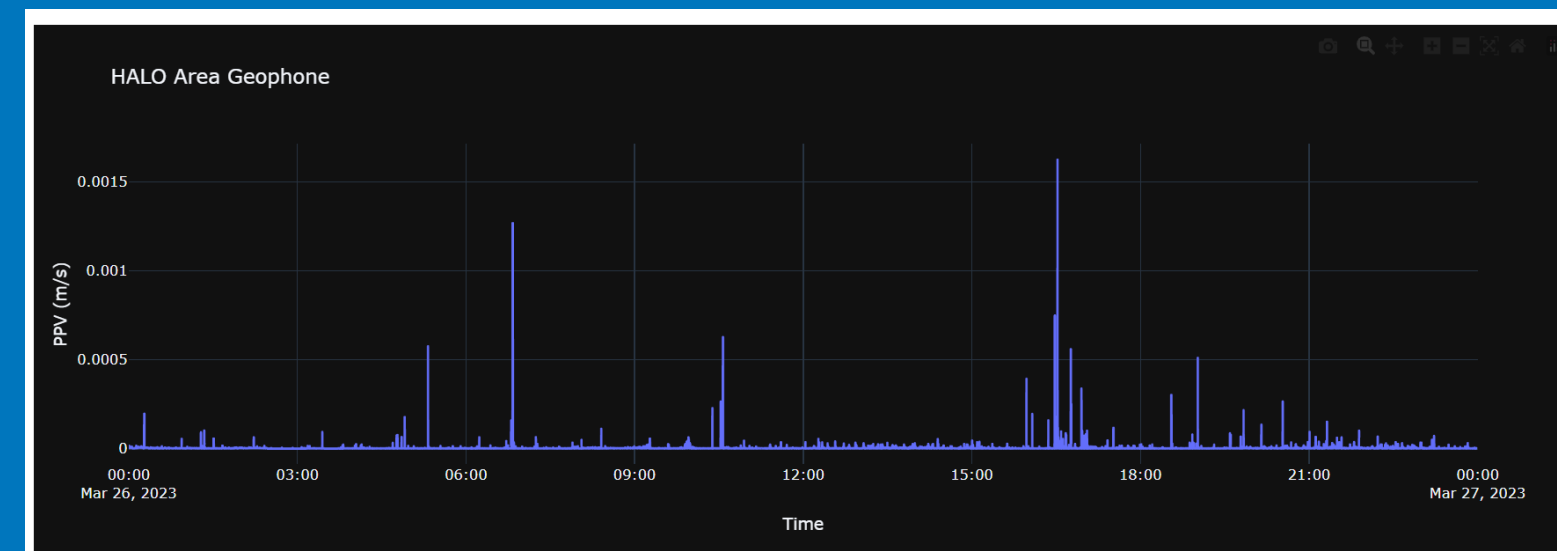
# Low Background Updates



- Detailed gamma spectra below 3 MeV in different areas of the laboratory is of interest with two 1.5 x 1.5 inch NaI(Tl) Currently 1 is measuring internal backgrounds while the second has started a lab survey to generate spectra for areas of interest in the lab
- Two seismic sensor stations are currently operational in the underground lab and measuring the activity on the lab.
  - Measurements of the underground fast neutron spectrum are underway
  - Counting since March 2023, need years exposure



Sample of raw data from one of the small NaI crystal after 7.4 days





# ICP-MS at SNOLAB



- Commissioned in June 2023
- Installed in class 2000 cleanroom.
- Agilent 8900 ICP-MS Model #200 Semiconductor Configuration
- Utilizing S-lens and Pt interface cones.
- Current cell gases being used:  $\text{NH}_3/\text{He}$  (10:90) [reaction gas],  $\text{H}_2$  [reaction gas], He [KED gas]



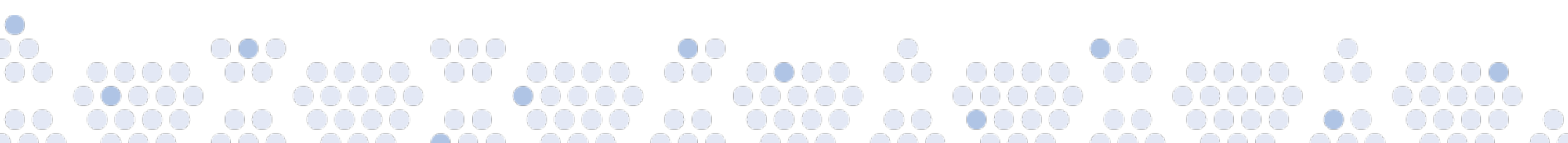
# Ultra Pure Water Monitoring

## Method Development

- First method under development is for UPW quality monitoring.
- Sample matrix: Aqueous samples with trace level (10 ppb maximum) analytes in 2% HNO<sub>3</sub>
- Method currently set up to analyze 56 analytes
- Detection limits (DLs) estimated using method blanks, 3 sigma (*not final*):
  - 0.15 ppt Thorium
  - 0.02 ppt Uranium
  - 6.78 ppt Lead
- Ongoing QA for distilled nitric acid purity to ensure consistent low reagent-based backgrounds + other important development work ongoing

# Future Applications of ICP-MS at SNOLAB

- Next development priority for the ICP-MS are isotopic ratio and dilution protocol for key analytes.
- Must establish sample preparation and preconcentration methods that allow for analysis of isotopes at trace abundance.
- Development of methods to analyze specific analytes.
- Should see improved DLs in more specific methods relative to the broader parameters needed for the 56 analytes observed with the UPW method.
- General ability to manage and analyze samples with more complex matrices.
- Setup sample treatment methods to reduce matrix of these types of samples (e.g. resin columns) to ensure ICP-MS retains optimally low backgrounds.
- Don't expect items on this list quickly.





A black and white photograph of a complex scientific instrument, likely a neutrino detector. The image shows a dense network of metal pipes, cables, and various mechanical components. A central vertical structure with a platform is visible, surrounded by a large array of smaller, circular detectors or sensors. The overall appearance is that of a highly technical and intricate piece of equipment.

*Discussion*







## Experiments in Development: 9 (including experiment upgrade projects)

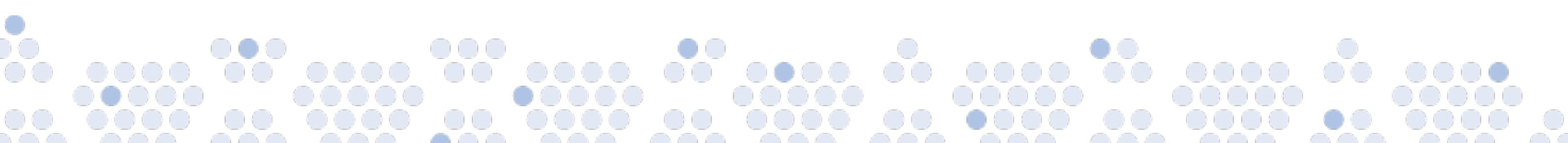
<i>Experiment</i>	<i>Description</i>	<i>GW</i>	<i>Status</i>	<i>Space allocation</i>
DEAP-3600	Upgrades to cooling tower, neck, and AV piping	GW-3	Construction	31-Mar-2025
CTBT-HPGe	Dual HPGe for Health Canada CTBT	GW-2	Construction	SNOLAB facility
SuperCDMS	Si/Ge cryogenic Dark Matter experiment	GW-2	Construction	31-Dec-2027
PICO-500	Bubble chamber Dark Matter exp – 500kg	GW-1	Design	31-Dec-2026
SBC	Scintillating Bubble Chamber – Dark Matter	GW-1	Design	31-Dec-2024
LEGEND-1000	HP Ge in liquid argon 1000kg – 0v double beta	GW-0	Development to DOE CD-1	Not allocated
nEXO	Xenon TPC - 0v double beta	GW-0	Development to DOE CD-1	Not allocated
OSCURA	Cryogenic skipper CCDs Dark Matter – 10kg	GW-0	Concept development	Pending DOE
SNO+Te	Tellurium Double Beta Decay in SNO+	EoI	R&D	Not allocated



## Facility Equipment Projects: 8

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<i><b>Project</b></i>	<i><b>Description</b></i>	<i><b>GW</b></i>	<i><b>Status</b></i>
P2010	Seismicity monitoring system	GW-3	Project close out
P2011	Surface Cryostat	GW-2	Construction
P2111	UG Compressed Air upgrade	GW-2	Commissioning
P2109	Radioactivity Backgrounds Measurements	GW-2	Procurement
P2108	Mobile cleaning/etching module	GW-0	Construction
P2104	MPC Breaker Upgrade	GW-1	Construction
P2205	Denka Boom	GW-1	Fabrication
P2301	HC Environmental Monitoring Station	--	Construction



## Experiments in Operation: 10

<i>Experiment</i>	<i>Description</i>	<i>GW</i>	<i>Space allocation</i>	<i>Suggested extension</i>
CUTE	Cryogenic test detector – 15mK	GW-3	31-Dec-2024	Now SNOLAB facility
DAMIC	Cryogenic CCDs for dark matter	GW-3	31-Dec-2024	
FLAME	Underground metabolic studies with fruit flies	GW-3	No commitment	Low space impact
HALO	He-NCDs and 80T Pb – neutrons from supernova	GW-3	31-Dec-2021	No request
NEWS-G	Spherical gas TPC 1.4m	GW-3	31-Mar-2025	Dave needs to check date
PICO-40L	Bubble chamber with superheated freon	GW-3	31-Mar-2025	Dave needs to check date
REPAIR	Genomics studies in low radioactive environment	GW-3	31-Dec-2023	Low space impact Dave needs to check date
SENSEI	Cryogenic skipper CCDs Dark Matter – 100g	GW-3	31-Dec-2022	No request
SNO+	Liquid scintillator (anti)neutrino detector 780T	GW-3	31-Dec-2026	
Xe-Still	Noble gas distillation and isotopic studies	GW-3	31-Dec-2022	No request



