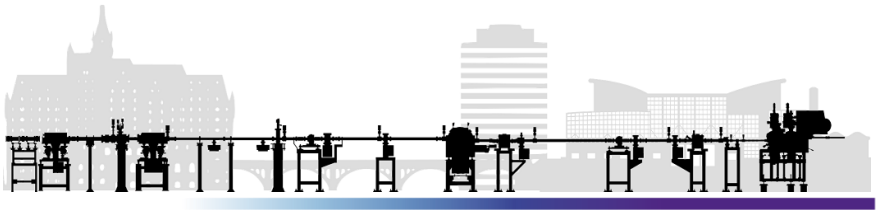
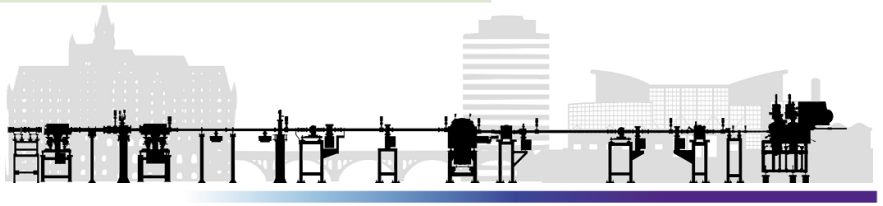
VLS-PGM CORRENT CAPABILITIES AND LATEST UPGRADES
Virtual Users Meeting, March 12th 2024

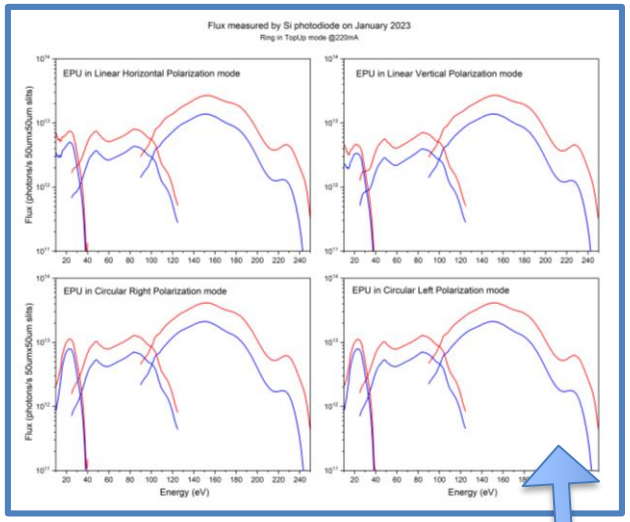
Lucia Zuin, Beamline Responsible

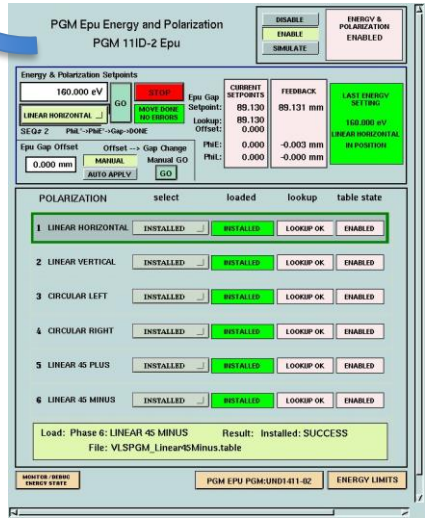


VLS-PGM Specifications	
CLS Port	11ID-2
Source	Elliptically Polarizing Undulator
Energy range & Resolution	15-250eV; E/ΔE > 10000
Spot Size	Branch A < 500μm (V) x 500μm (H) Branch B 20μm (V) x 200μm (H)
Photon Flux	Better then 2 x 10^{12} at 220mA ring current, measured with 50 μm x 50 μm slits Better then 1 x 10^{13} in the 130eV-200eV region
Technique	XAS (Total/Partial Fluorescence Yield, Total Electron Yield, Optical Luminescence)
Elements/edges	Li, B K-edges; Al, Si, P, S, Cl L-edges
Detectors	MCP, SDD, optical spectrometer
Beamline sensitivity	~2% element concentration (element's concentration >20000ppm)



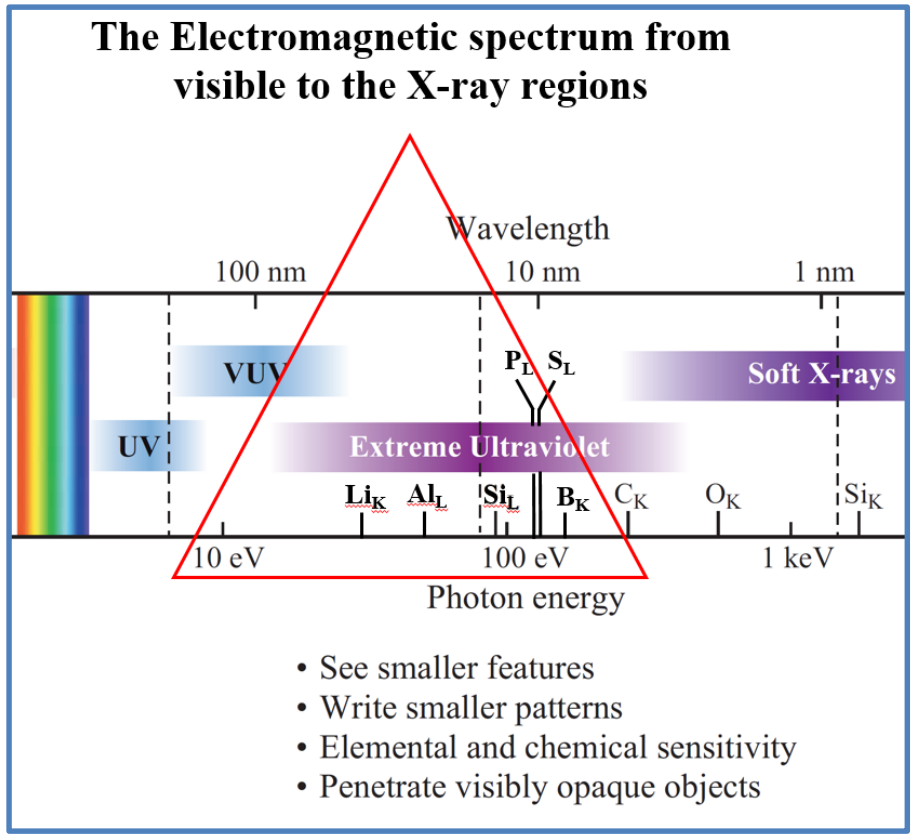
Journey of the Elliptical Polarizing Undulator

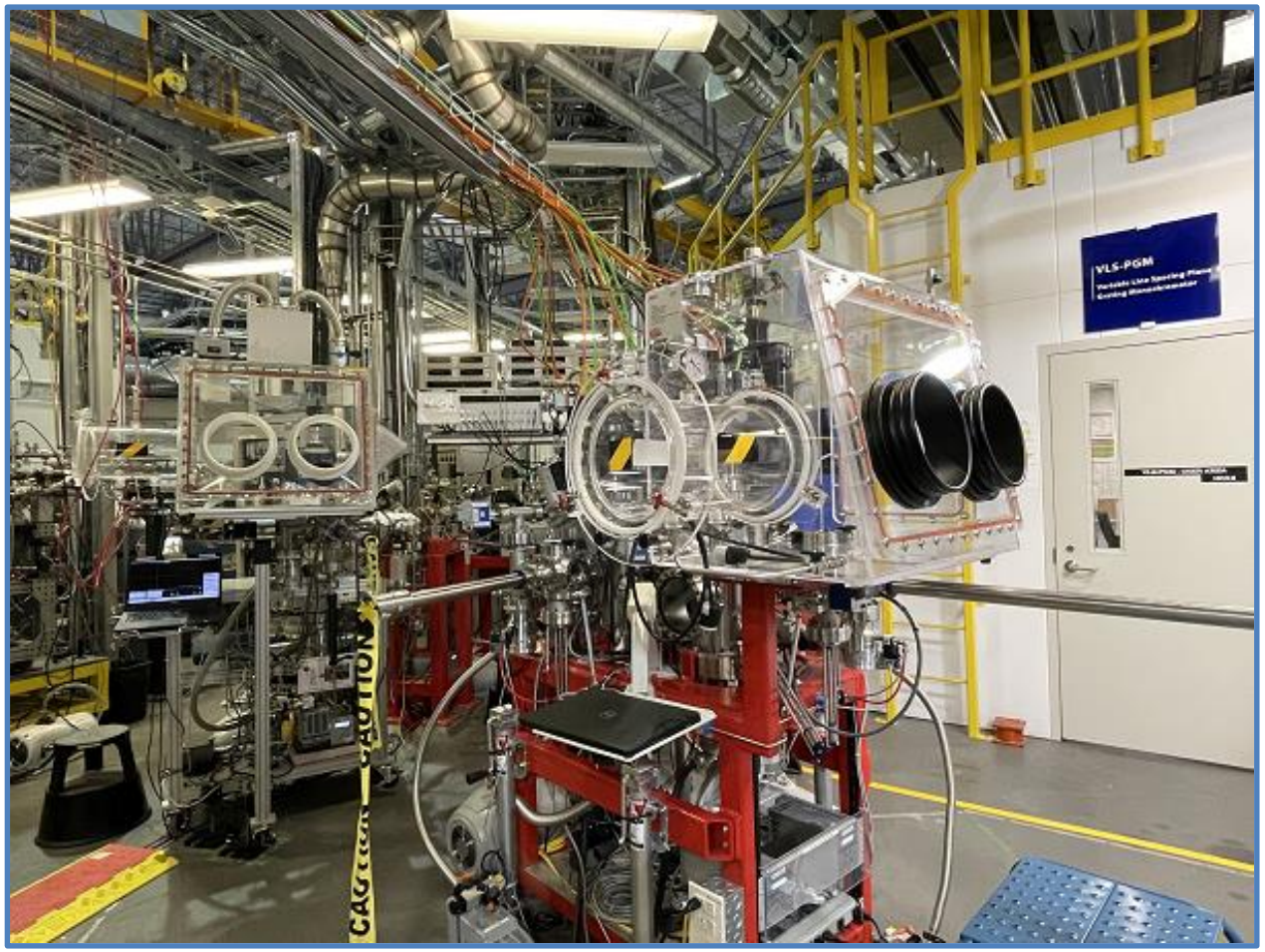


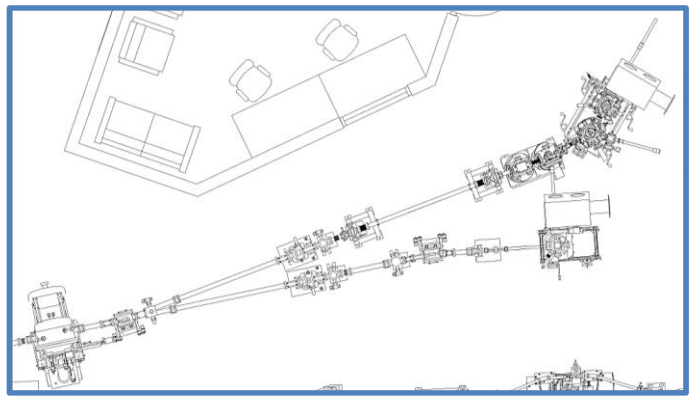


Specifications	
Energy	15eV – 250eV
Harmonic	1st only
Polarization modes	Linear Horizontal Linear Vertical Circular Right Circular Left
GUI/Look-up tables	Yes, for all modes

VLS-PGM has its own special niche: very soft x-ray XAS of L-edges of important low-Z elements (Cl, S, P, Si, Al) combine with K-edges of Boron an Lithium. Well suited combination for a number of CLS strategically important scientific disciplines.

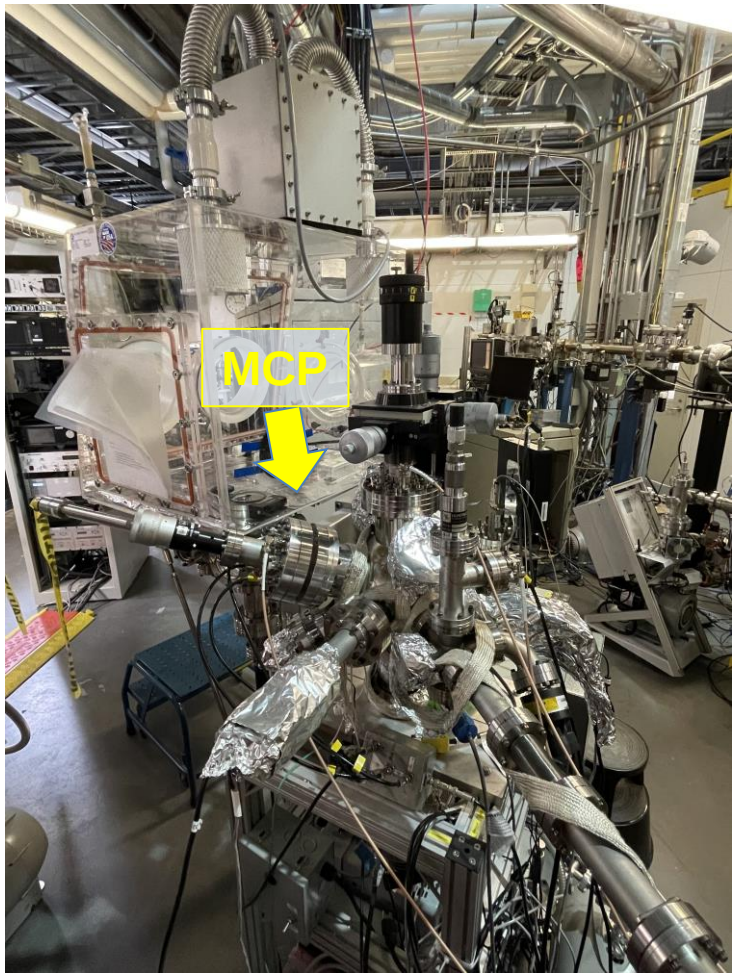


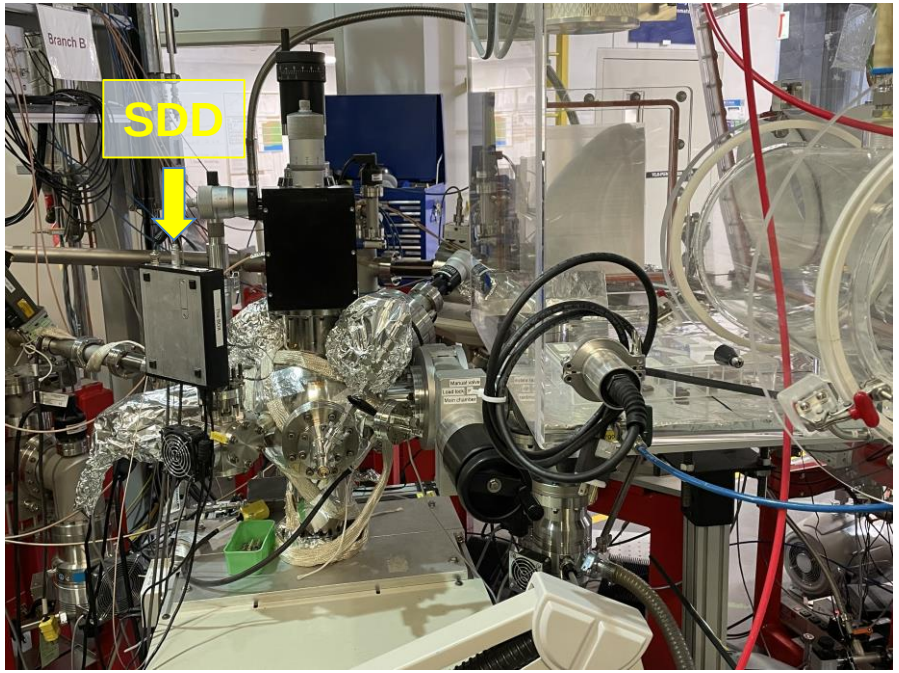




Canadian Light Source | Centre canadien de rayonnement synchrotron

min k: the small/old endstation on Branch A



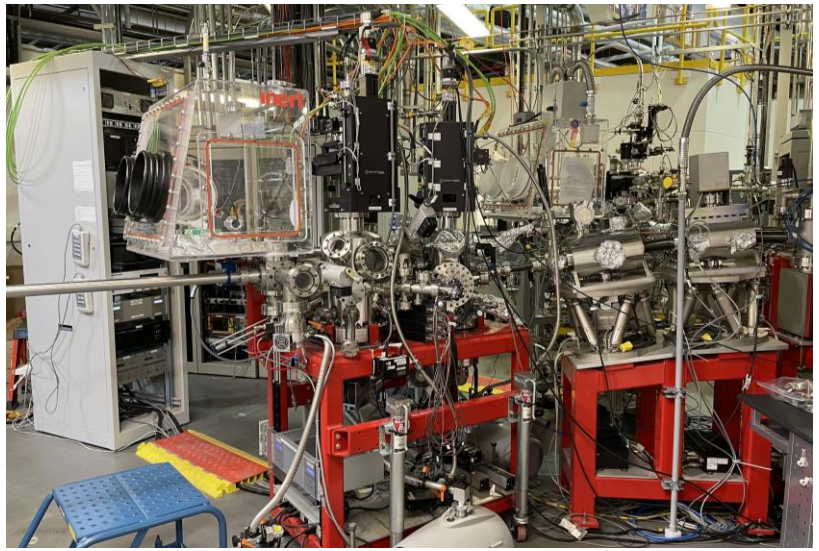


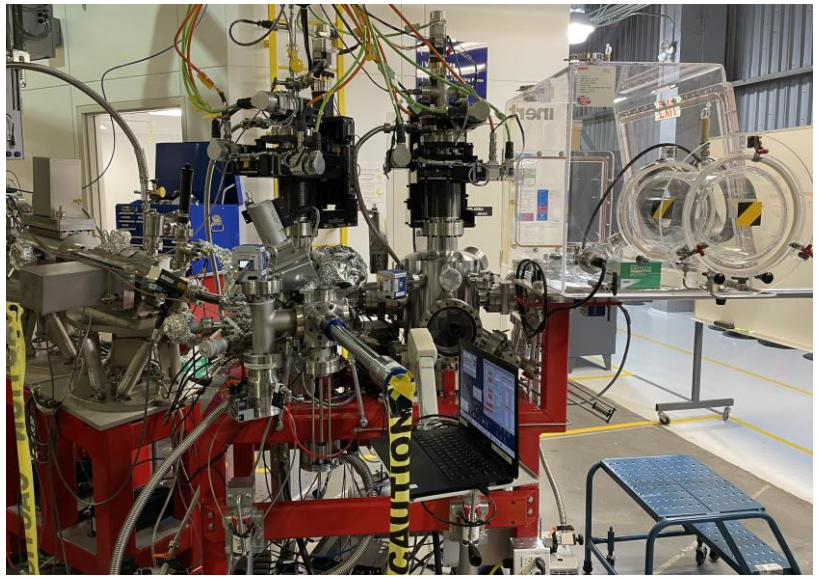
- MCP detector for Total Fluorescence
- 1 element SD-Detector for Partial Fluorescence, above 130eV
  (P; S; Cl L-edges; B K-edge)
- XEOL
- TEY
- Loading chamber with 3-sample carousel; Glove box

- Beam spot at the sample position 400um(H) x 400um(V)

Yet to come:
Fully motorized manipulator

Maj K: the large/new-ish endstation on Branch B





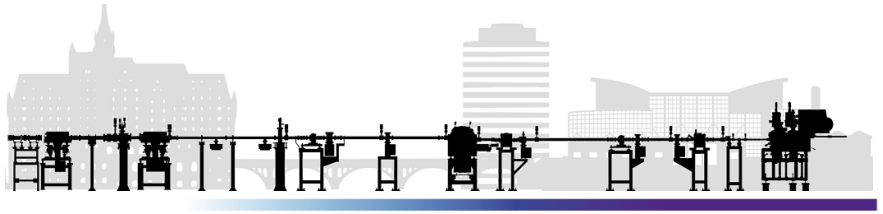
Main chamber:

- MCP detector for Total Fluorescence
- 4 elements SD-Detector for Partial Fluorescence, above 130eV
- XEOL
- TEY
- Cryo-cool, fully motorized manipulator
- Loading chamber with 4-sample carousel

- Beam spot at the sample position 200um(H) x 20um(V)

Prep chamber:

- Loading chamber with 4-sample carousel; Glove box
- Various port for samples preparation (e.g. evaporator, etc)

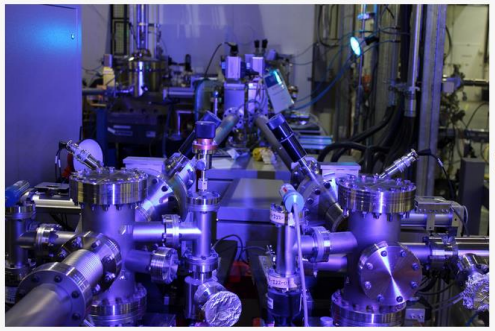


Canadian Light Source | Centre canadien de rayonnement synchrotron

https://vlspgm.lightsource.ca

Variable Line Spacing Plane Grating Monochromator Beamline

Home | BL Spec | Manuals & useful information | BL Posters | Publications | Contact Us | THE MAPLE PROJECT



Facilitating research in materials of both fundamental and applied nature, the VLSPGM beamline provides high resolution, low energy spectroscopic studies.

Equipped with a solid state absorption chamber Users can perform experiments requiring techniques such as

- X-ray absorption spectroscopy (TEY and FLY)
- X-ray excited optical luminescence spectroscopy (XEOL)

We invite Users and Collaborators to discuss their proposal with the Beamline Staff before the submission deadline. This is crucial for a careful assessment of the experiment feasibility.

11ID2: The Variable Line Spacing Plane Grating Monochromator Beamline

Extreme Ultraviolet (15-250eV)

Quicklinks

- Machine Status
- User Portal: Guide
- Shipping to CLSI
- Student Travel Support
- Workshop on how to write a proposal for beamtime at CLS
- Critical points to be addressed in a VLSPGM Proposal
- VLSPGM example proposal

List of Publications »

Mikhchian, Mehrnaz; Grosvenor, Andrew P. (2024). *An investigation of the long-term aqueous corrosion behaviour of glass-zirconolite composite materials (Fe-Al-BG-CaZrTi2O7) as a potential nuclear wasteform.* Corrosion Science 228, 111831. 10.1016/j.corsci.2024.111831.

Xie, Xiu-Zhen; Kuang, Huiyao; Wiens, Eli; Deevsalar, Reza; Tunc, Ayetullah et al. (2024). *Synthesis of jadarite in the Li_2O–Na_2O–B_2O_3–SiO_2–NaCl–H_2O system: FTIR, Raman, and Li and B K-edge XANES characterizations and theoretical calculations.* European Journal of Mineralogy 36(1) , 139-151. 10.5194/ejm-36-139-2024.

Jia, Ruiliu; Dai, Hongliu; Tu, Xingchao; Sun, Chuang; Sun, Shuhui et al. (2023). *Hexabutylcyclohexane-1,2,3,4,5,6-hexaimine Additive-Assisted Commercial Ester Electrolyte for 4.7 V Highly-Stable Li-Metal Batteries.* Advanced Energy Materials . 10.1002/aenm.202302747.

Canadian Light Source | Centre canadien de rayonnement synchrotron

Variable Line Spacing Plane Grating Monochromator Beamline

Home | BL Spec | Manuals & useful information | BL Posters | Publications | Contact Us | THE MAPLE PROJECT

Manuals & useful information

Users Manual

This manual has instructions that cover basic beamline operation, some troubleshooting tips, XAS data acquisition software and sample loading procedure. Any VLSPGM users can benefit from a read-through of this document.

BL Process Variables

Although this document is of particular importance for the XAS Users, the listed PVs cover every optical component of the whole BL. In particular, for every XAS saved file the recorded process variables (Energy, TE yield, FL yield etc.) are listed using the following Process Variables format.

Most frequent problems and troubleshutting instructions

Section of the manual that covers the most frequent problems the Users encounter. The assistence of the Floor Coordinator (x3639) will be required.

Sample preparation

It offers step-by-step instructions on how to prepare samples using the provided sample holders.

XAS Sample transfer procedure

It offers step-by-step instructions on how to load and unload a sample in the XAS chamber.

- How to write a proposal for beamtime at CLS
- Critical points to be addressed in a VLSPGM proposal
- VLSPGM example proposal

-- Section from the Users Manual --

Data Acquisition at the VLSPGM

For the standard XAS measurements, where Total Electron Yield (TEY) and Total Fluorescence Yield (FLY) are recorded, the VLSPGM provide two alternative forms of data acquisition configurations: Step Scan and Fast Scan. Users can choose the configuration best suited to their study.

In case Users experiments required data collected with the XEOL detector for Total Luminescence yield, only Step Scan is available.

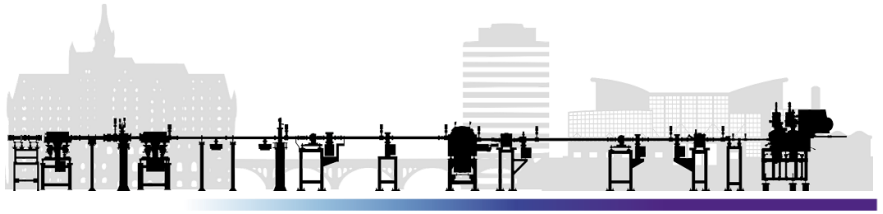
The differences between Step and Fast scans are briefly outlined:

Step scan characteristics

- Users decide the energy range (e.g. 158eV to 130eV), the dwell time (e.g. 1 second) and the step size (e.g. 0.1eV) for each scan.
- The measurement at each energy point (e.g. 158; 157.9; 157.8 etc.) occurs after the motors have stopped.
- The total duration of a typical 1sec-dwell-time scan is largely caused by the dead time required for starting and stopping the motors at each energy point.
- The points are equally energy spaced by the value input as step size (Delta Value).
- Typically, the duration of a 25eV scan is ~20 minutes

Fast (on-the-Fly) scan characteristics

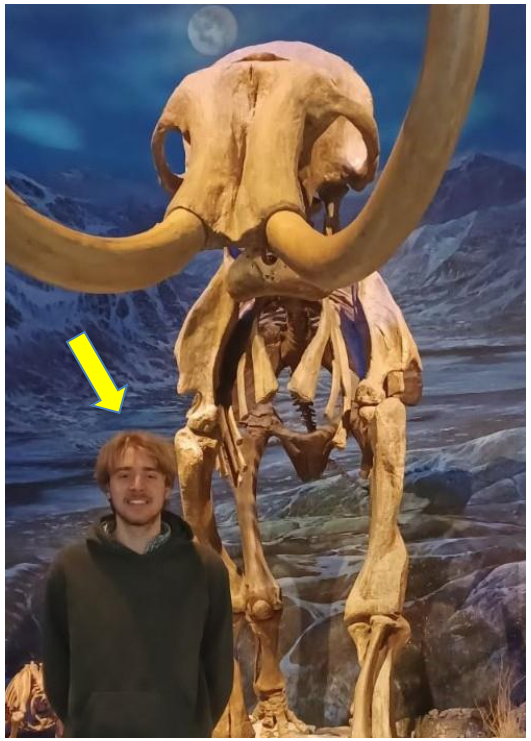
- Energy range, dwell time and step size for each scan are pre-set and not changeable.
- At the start of the scan the motors go to the final point and the instrumentation recording the signals (e.g. Io, TEY and FLY) are sampled along the motion at consistent measurement times (1 second).
- The provided "mean Energy fbk" value should be used when analyzing the data and as x-axis when plotting the resulting spectrum.
- The points within a scan are not equally energy spaced.
- Typically the duration of a 25eV scan is ~5 minutes



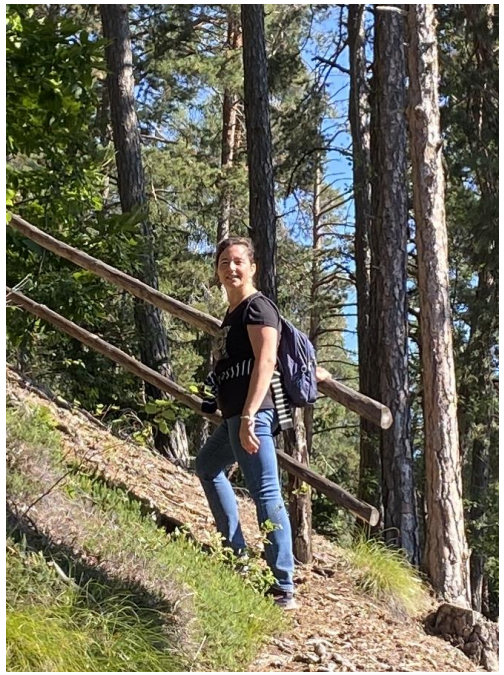
https://vlspgm.lightsource.ca

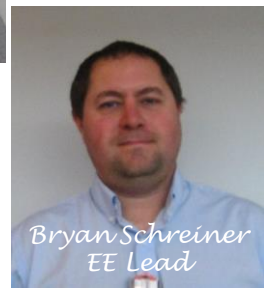
The VLS-PGM TEAM

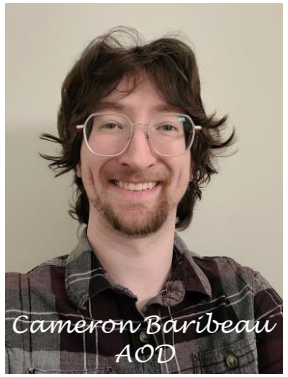
Daniel Correia
Support Scientist

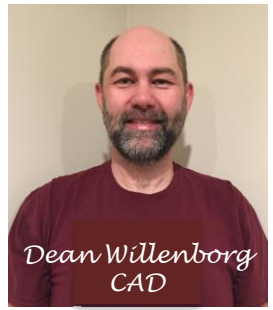


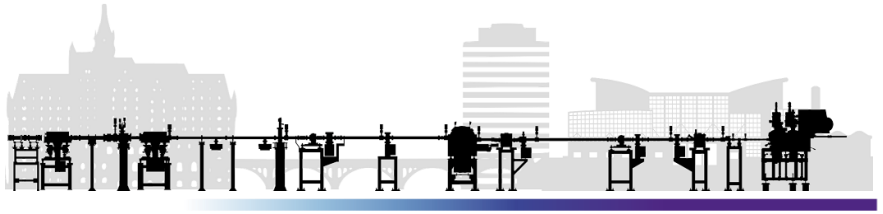
Lucia Zuin
BL Responsible











Canadian Light Source | Centre canadien de rayonnement synchrotron


QUESTIONS