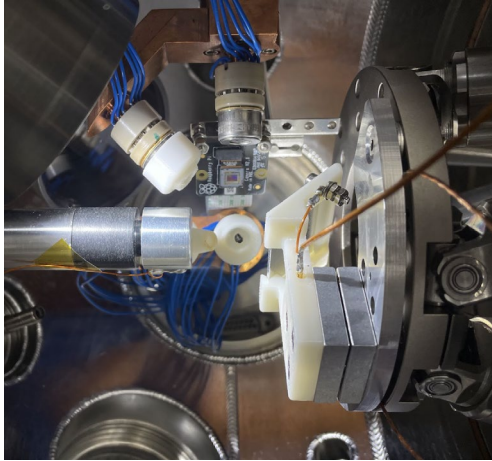


# Photon Detector Activities at the Canadian Light Source



T. Regier, IFDEPS

March 18, 2024

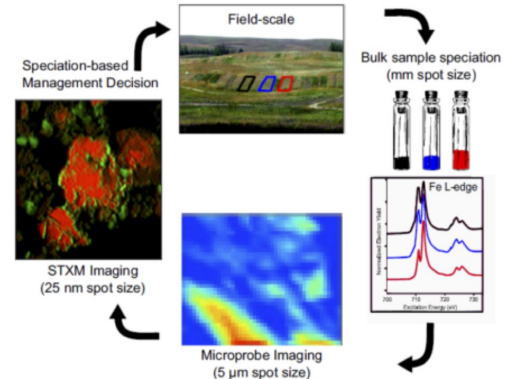
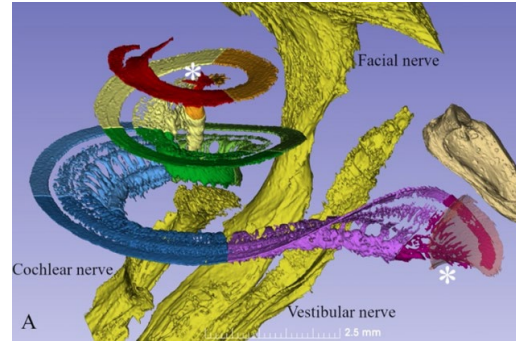
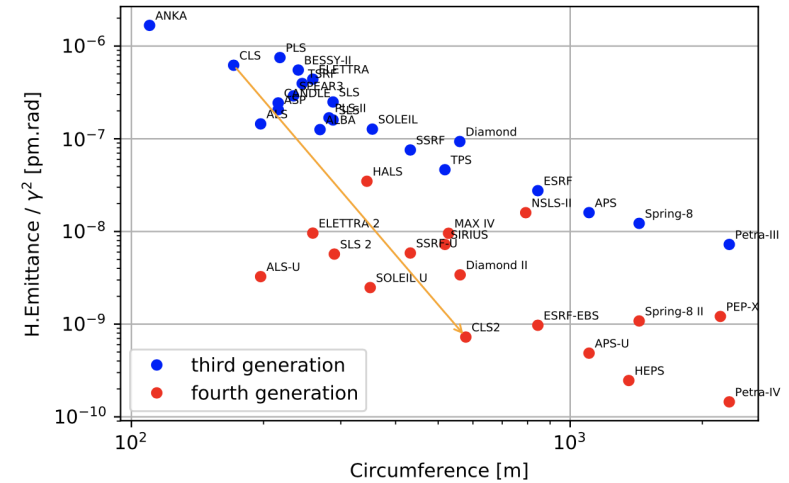
# Facility Status

## Machine

- 3rd Generation - User operations since 2006
- 2.9 GeV - 175m circumference
- Top-up
- Linac upgrade starting in April - reliability

## Beamlines

- Fully built out
- 23 Operational Beamlines
  - 2 x IR
  - 5 x Soft x-ray
  - 1 x X-ray Lithography
  - 5 x Hard X-ray Scattering / MX
  - 6 x Hard X-ray Spectroscopy
  - 4 x Hard X-ray Imaging

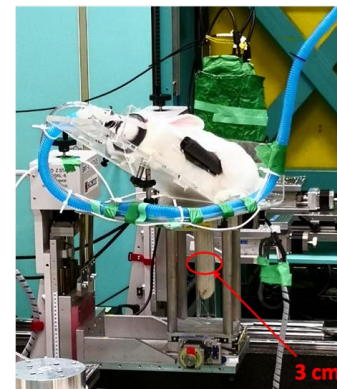




## Hard X-ray $\mu$ CT at Biomedical Imaging beamlines of CLS

- Submicron to tens of cm
- Dose - live animal imaging
- Low contrast materials - biological
- 15 to 140 keV

Beamline Scientist: Sergey Gasilov



**CAMERAS**  
Streaming:  
 PCO 4, 5.5  
Ultra-fast:  
 Dimax HS4  
Large sensor:  
 PCO 4000  
Highest QE:  
 PCO 4.2 bi  
 Andor Marana



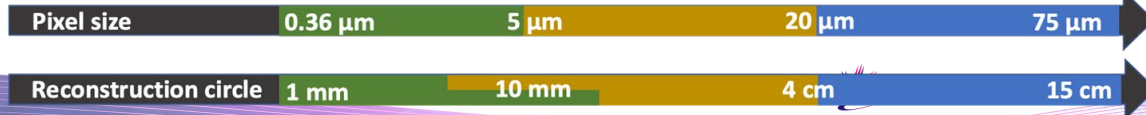
Microscopes (20x..2x)  
 Standard OP design



Macroscopes (2x..0.5x)  
 Custom made high NA  
 high resolution lenses



Large FOV (0.24x..0.15x)  
 Single high quality lens for  
 machine vision applications



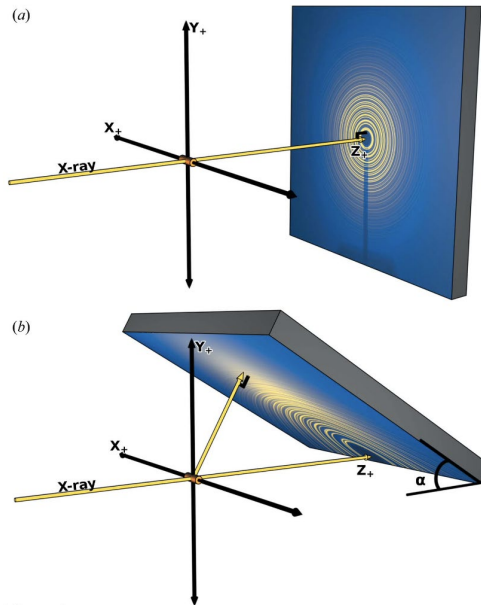




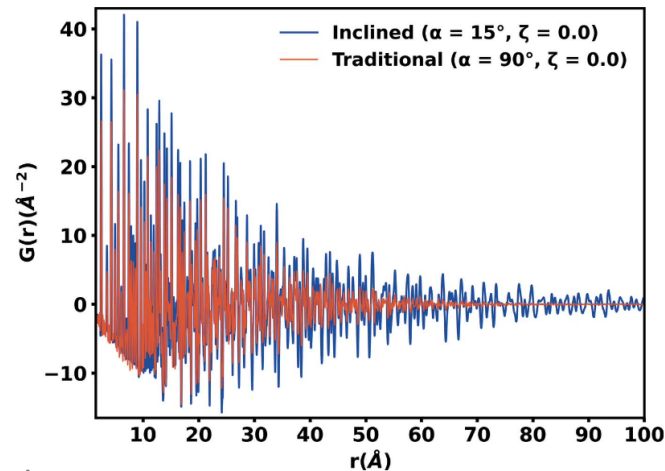
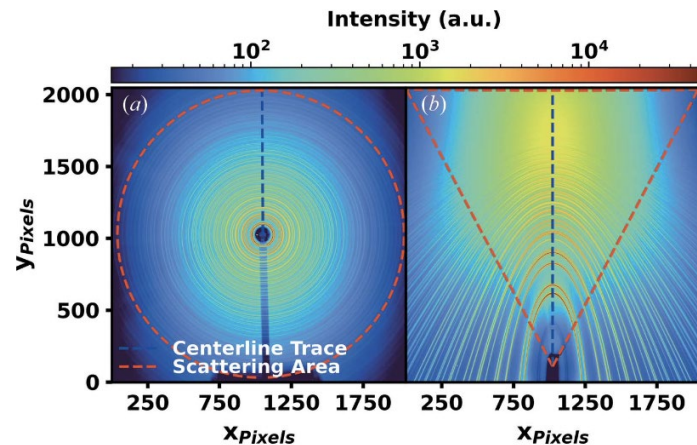
# Brockhouse Diffraction Sector Beamlines

## Hard X-ray Total Scattering with inclined detector geometry

- Improved scattering range
- Leveling of dynamic range - higher sensitivity at high Q
- Dramatic improvement in data quality and throughput



*J. Appl. Cryst.* (2023). **56**, 510–518



Spherical Grating  
Monochromator (SGM)  
Beamline



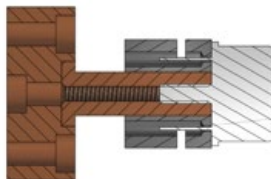
VLS-PGM



Soft X-ray SpectroMicroscopy  
Facility

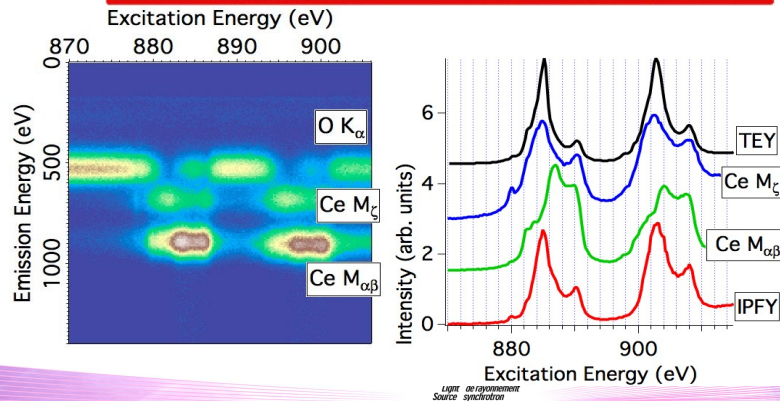
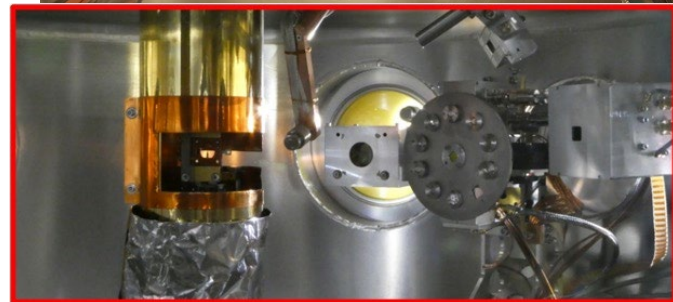
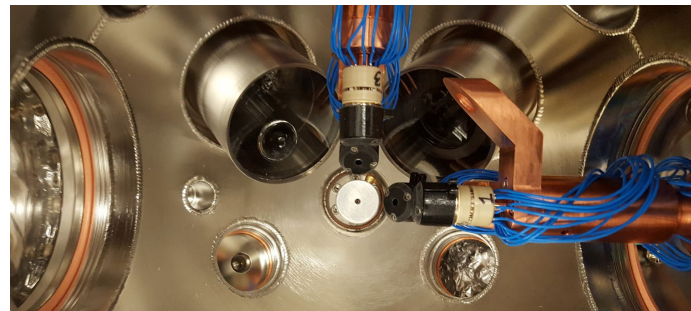
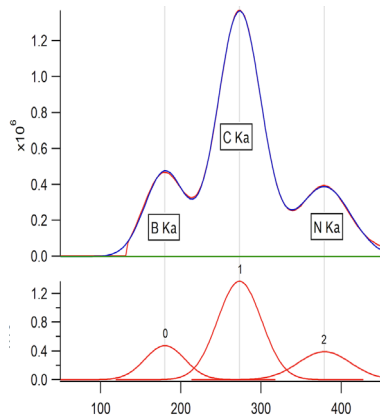


Resonant Elastic and Inelastic  
X-ray Scattering Beamline



Modular SDD development with  
improved low energy performance

- In-house expertise for mounting
- Custom geometry
- Interchangeable parts
- Optimized for low energy performance
  - 58 eV FWHM at B K - Al L and P L emission
  - 100 kcps - 400 ns shaping times



Light environment  
Source synchrotron

# Spherical Grating Monochromator (SGM) Beamline

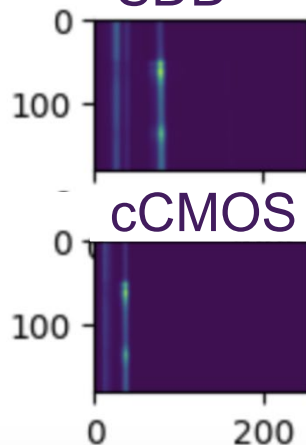


## Soft X-ray SpectroMicroscopy Facility

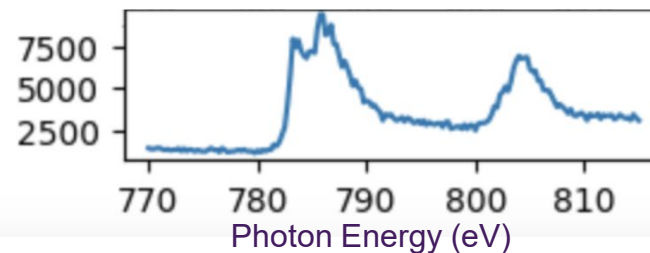
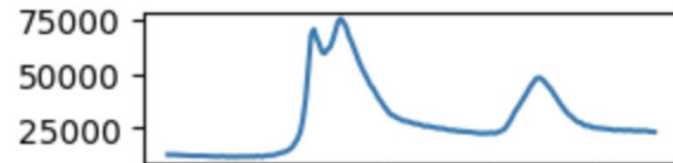
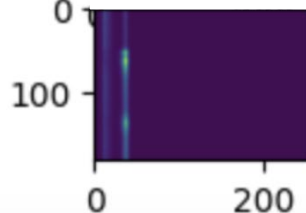
### CMOS Development

- sCMOS
  - ptychography
- Consumer CMOS - single photon counting
  - Spectroscopy applications

SDD

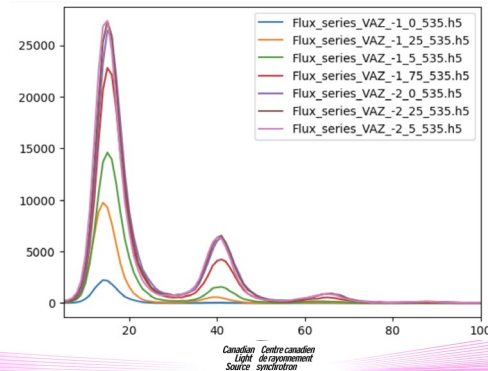
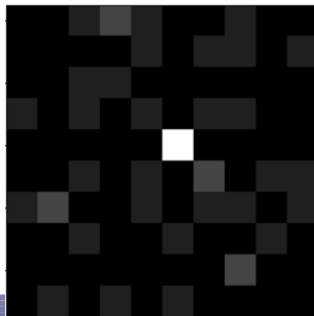
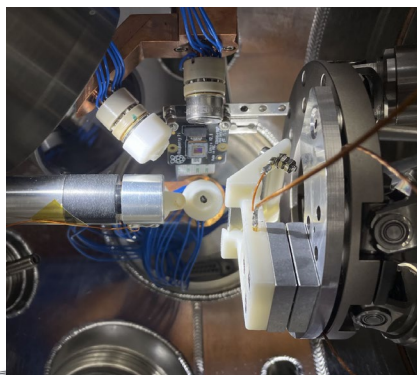


cCMOS - uncooled



Photon Energy (eV)

### 525 eV Photons - 200kcps



Canadian Centre canadien  
de rayonnement  
Source synchrotron