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Title:	Developments in the Microcalorimetry Program at Los Alamos National Lab
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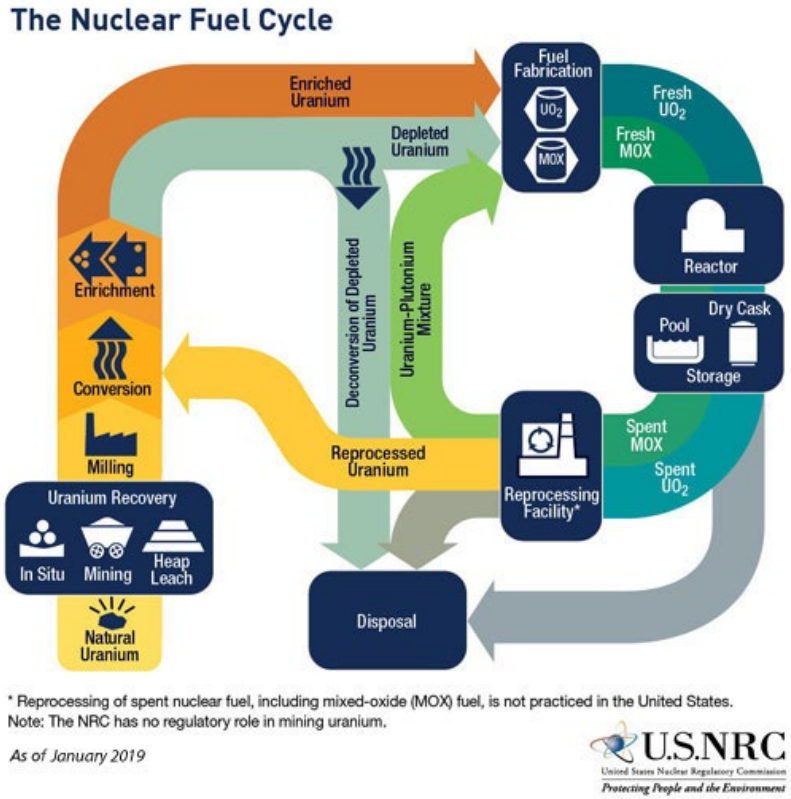
Developments in the Microcalorimetry Program at Los Alamos National Lab

Jacob Ward
NEN-1, Safeguards Science and Technology

November 3rd, 2023

LA-UR-23-XXXXX

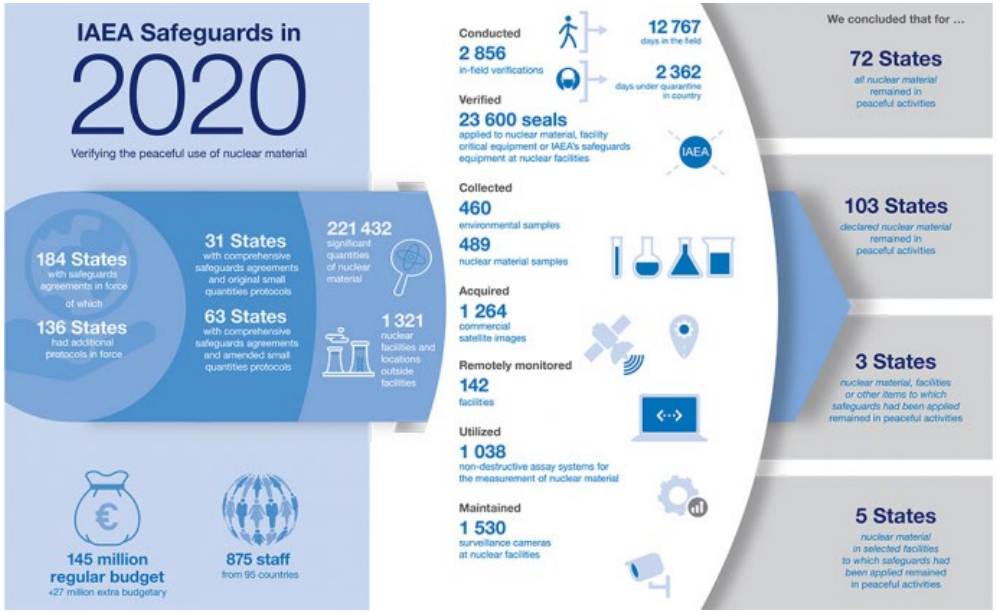
Nuclear Safeguards



Inspectors collect environmental samples → **Analysis at the environmental sample laboratories** → Confirm completeness of State Declarations

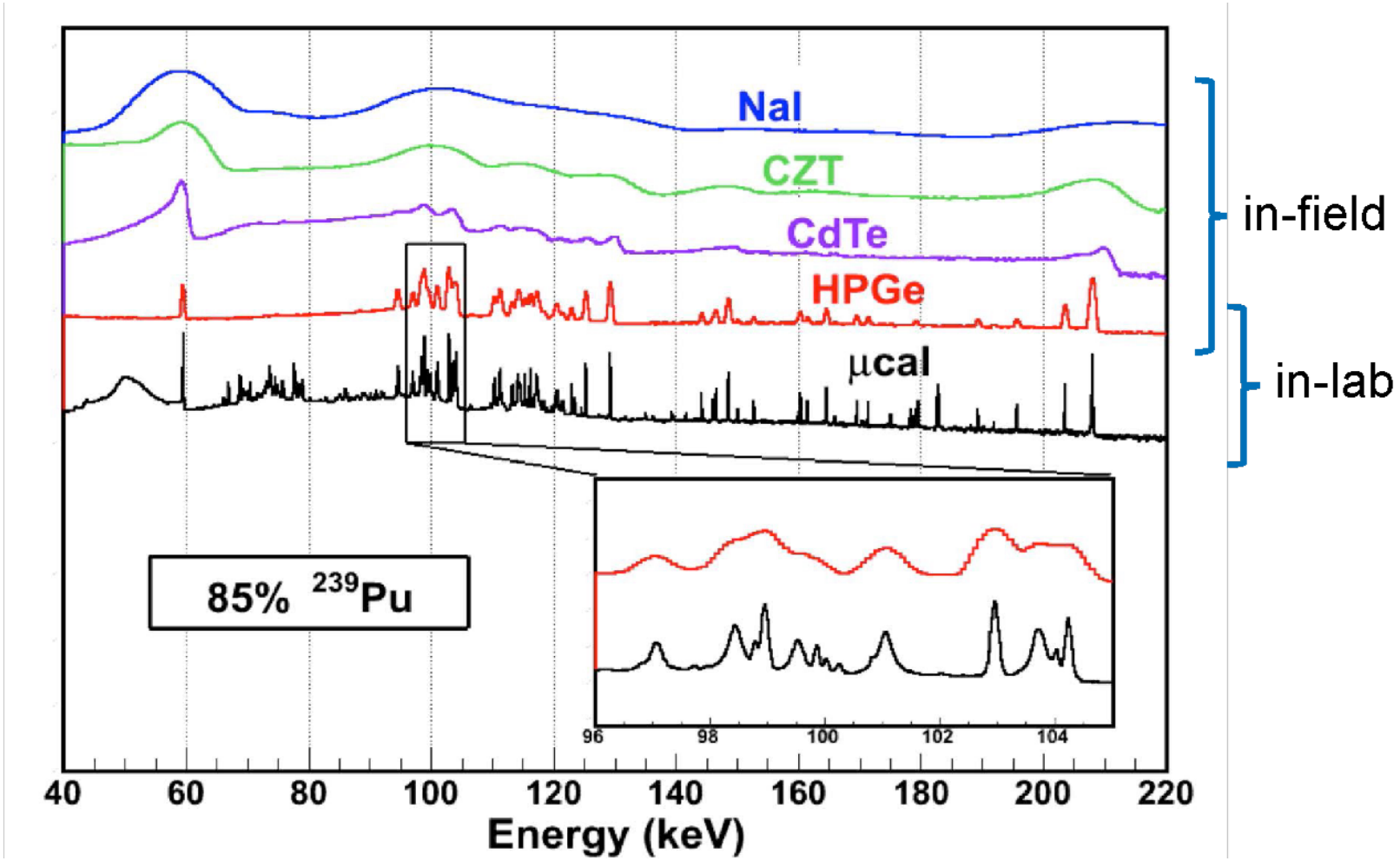
Inspectors collect nuclear material samples → **Analysis at the nuclear material laboratories** → Confirm correctness of State Declarations

Nuclear Safeguards

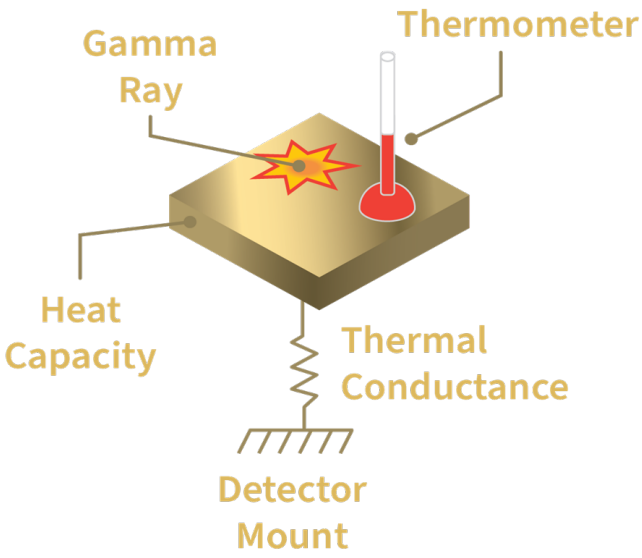


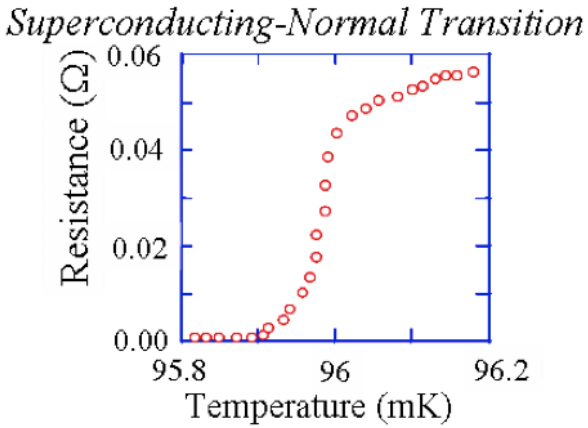
Nuclear Safeguards Tools

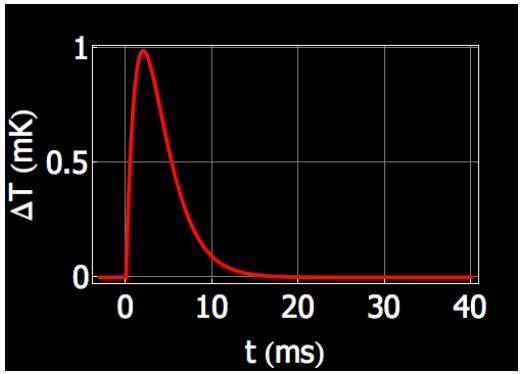
Nuclear Safeguards R&D Developments: Low Temperature Detectors



Transition Edge Sensors (TES)

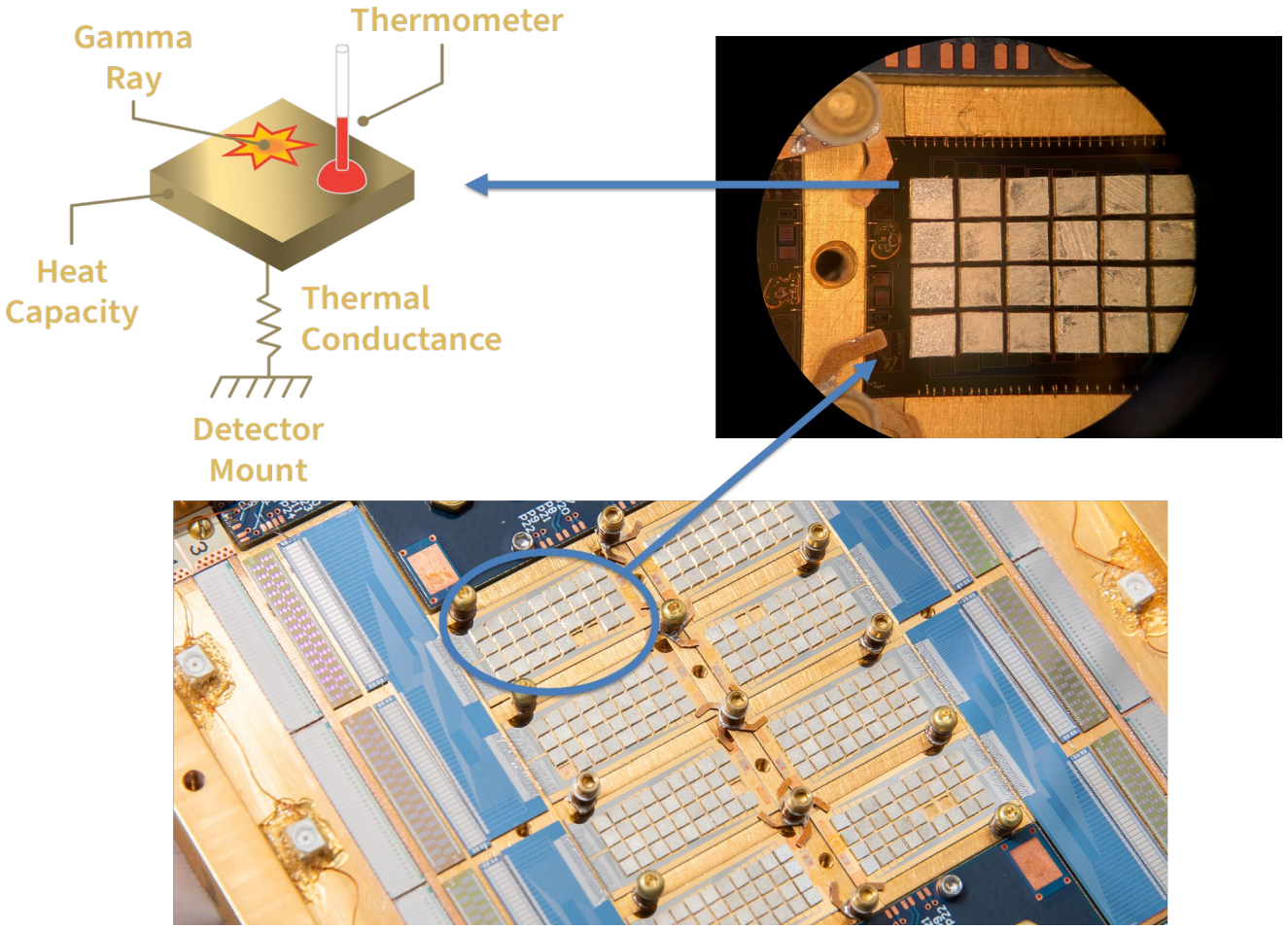




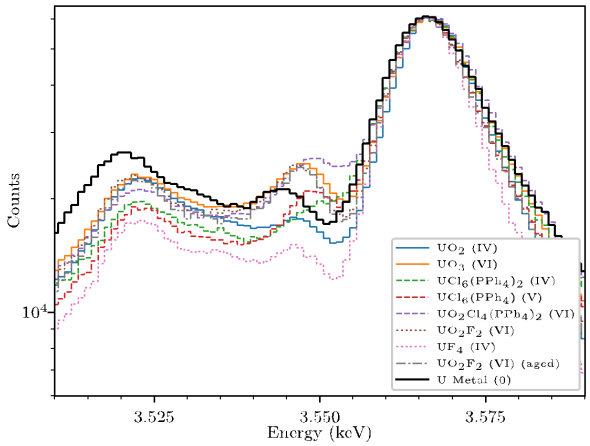


$$E = C \times \Delta T \qquad \Delta E \approx \sqrt{4kT^2C}$$

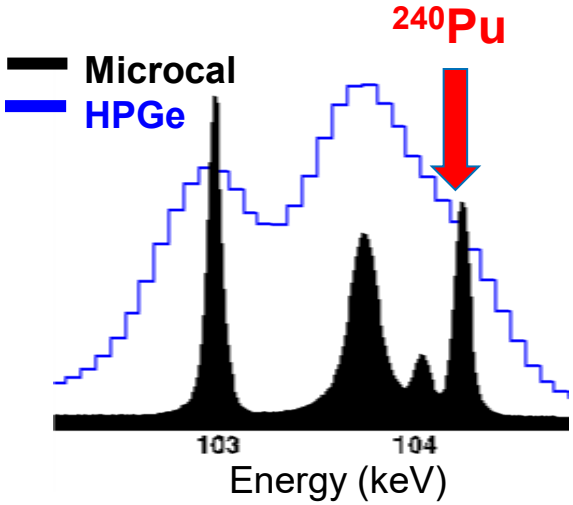
Microcalorimeters



Microcalorimeters

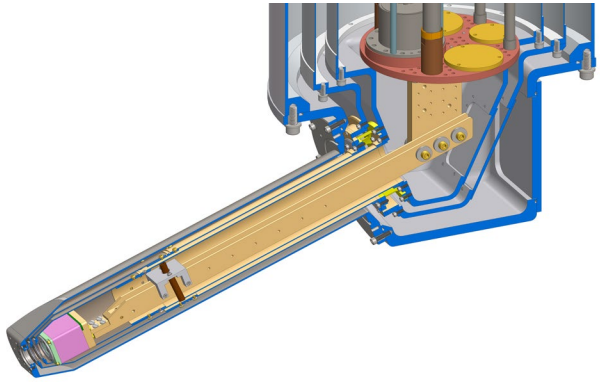


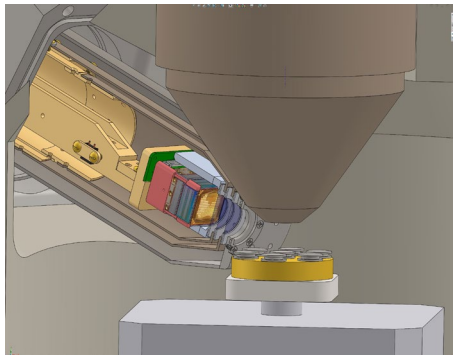
X-ray spectroscopy

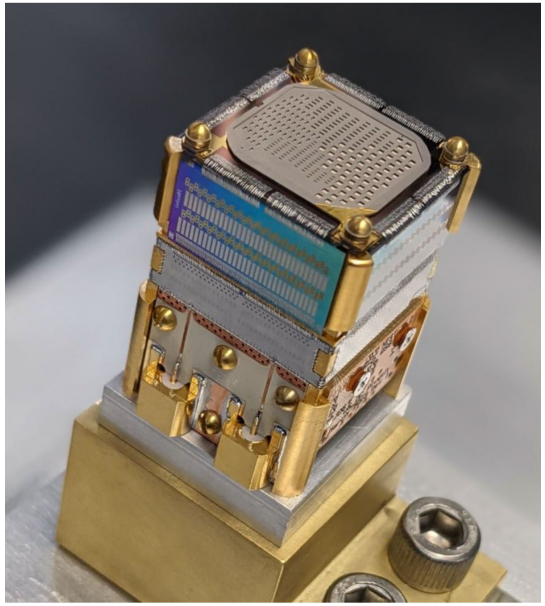


Gamma-ray spectroscopy

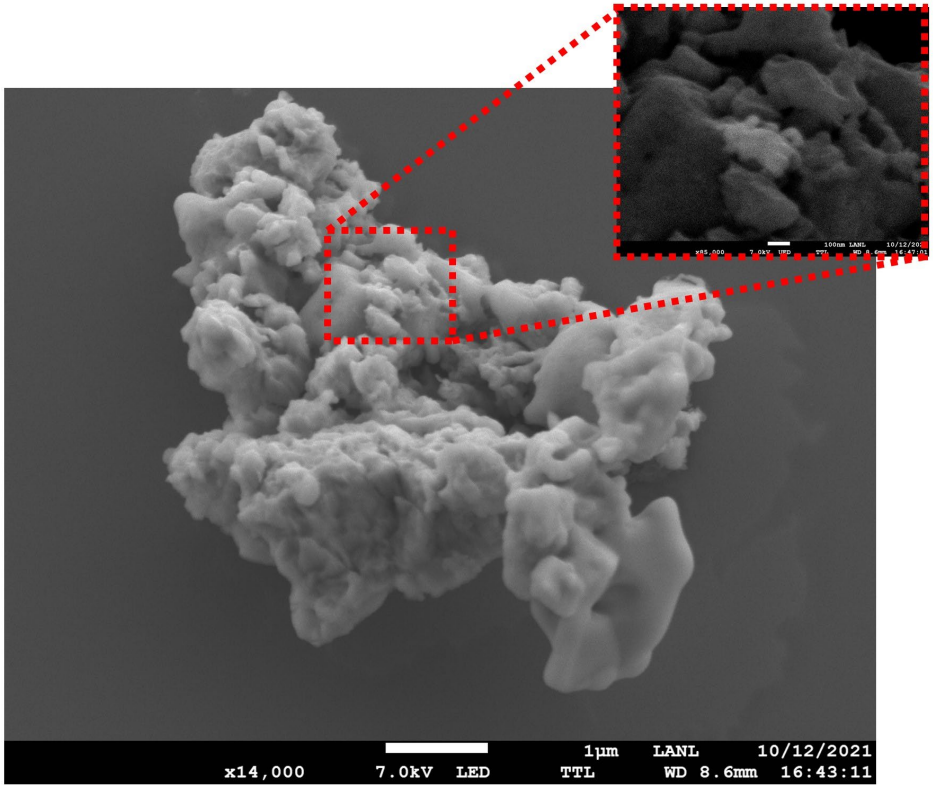
Hyperspectral X-ray Imaging (HXI)

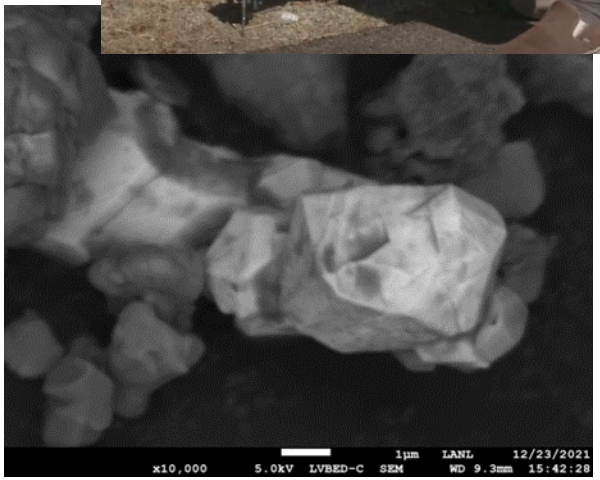






Hyperspectral X-ray Imaging (HXI)





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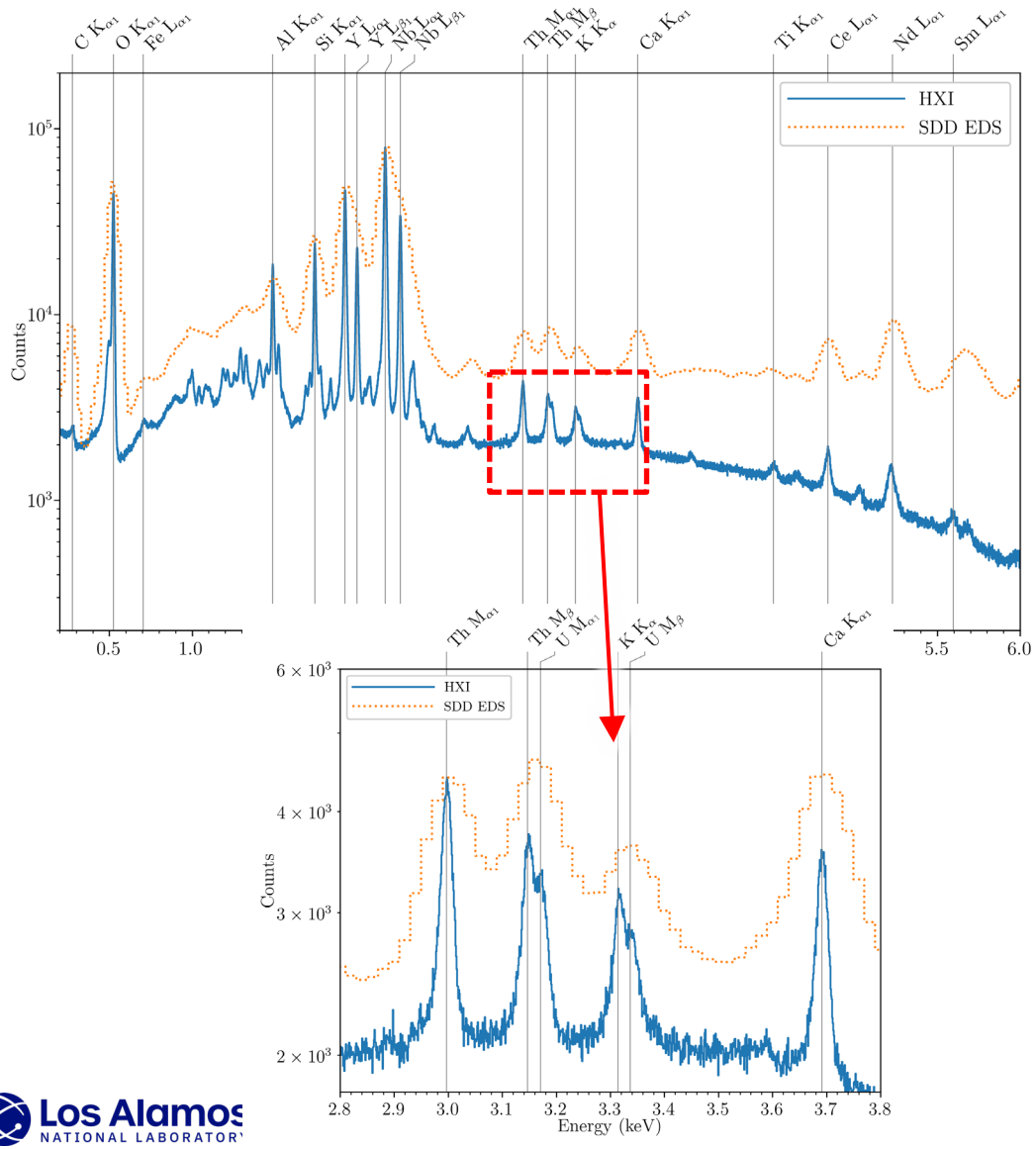
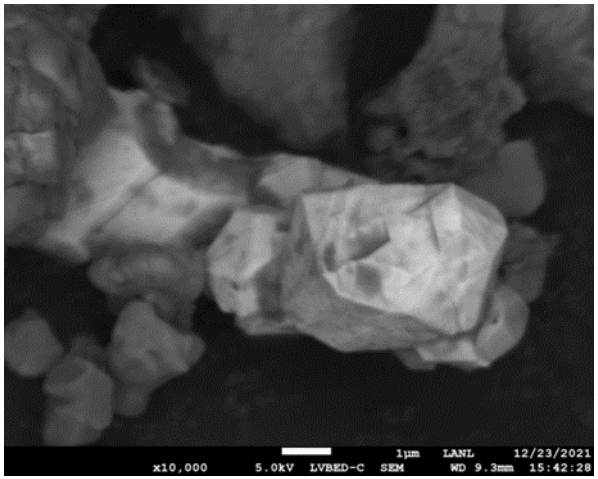




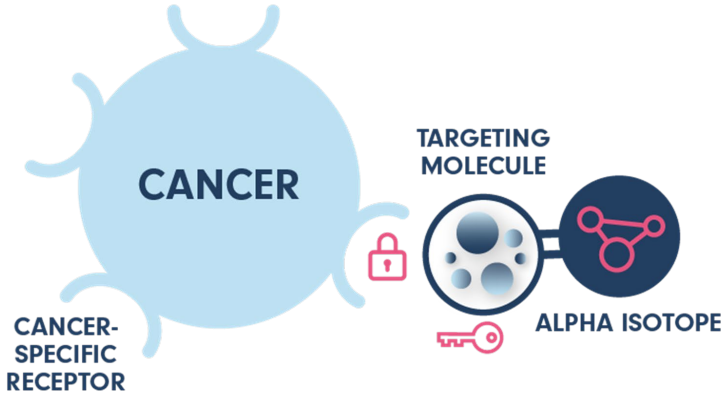
Spectrometer Optimized for Facility Integrated Applications (SOFIA)

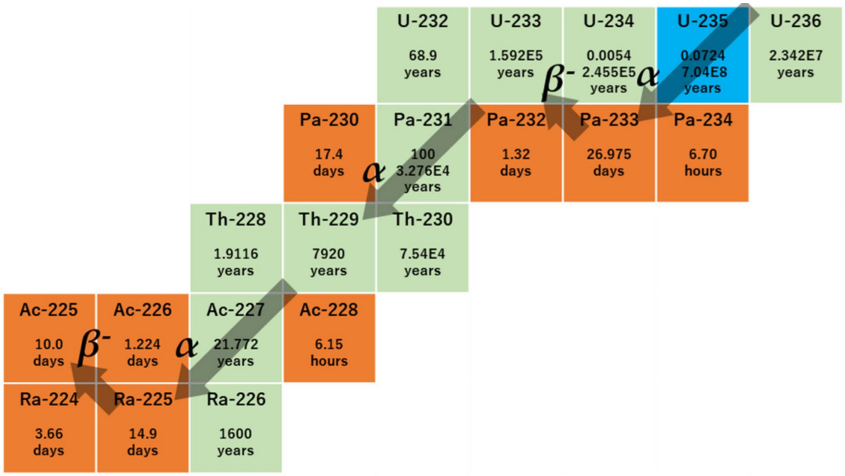
2022 R&D 100 WINNER

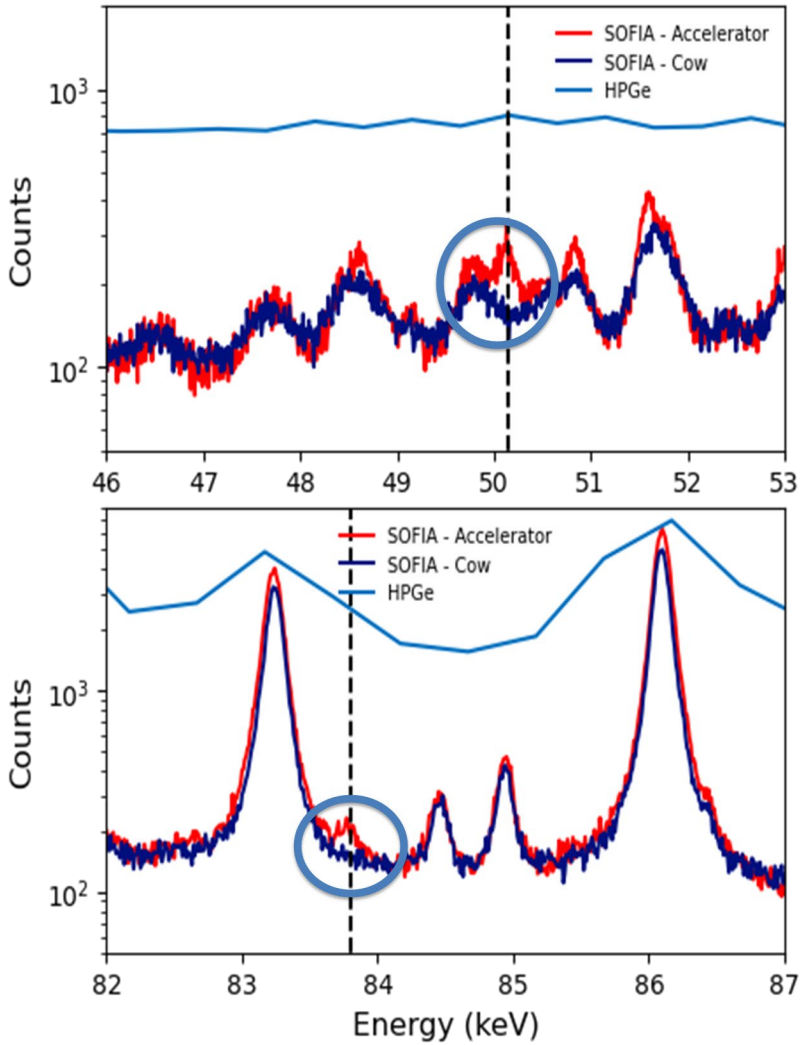
SOFIA
Spectrometer Optimized for Facility Integrated Applications

Los Alamos NATIONAL LABORATORY

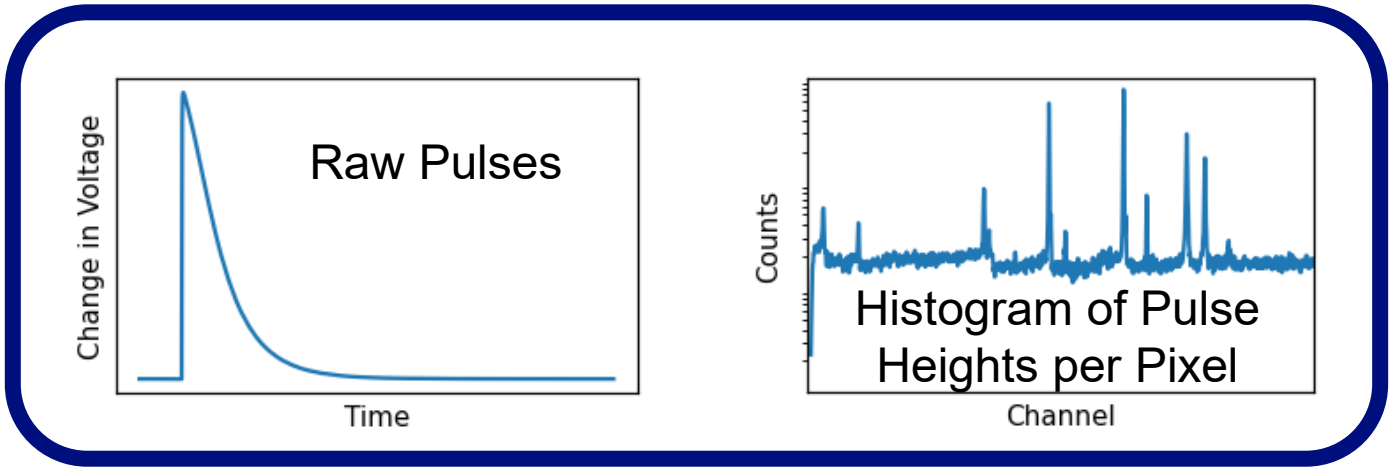
Targeted Alpha Therapy Using Actinium 225 Measured with SOFIA

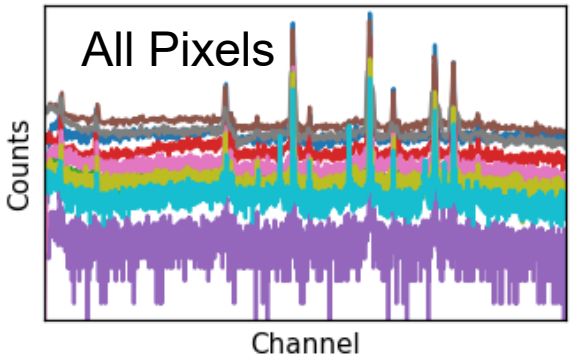


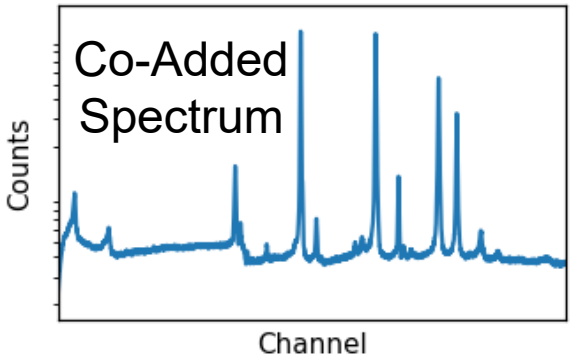


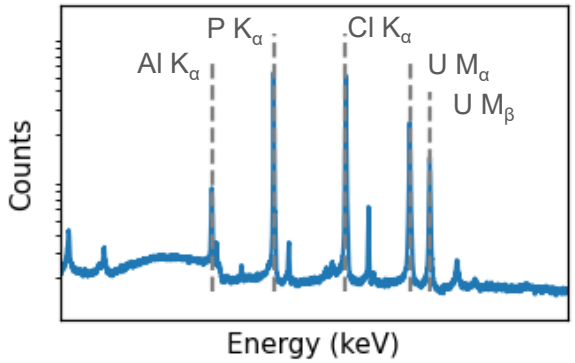


Raw Data to Spectrum



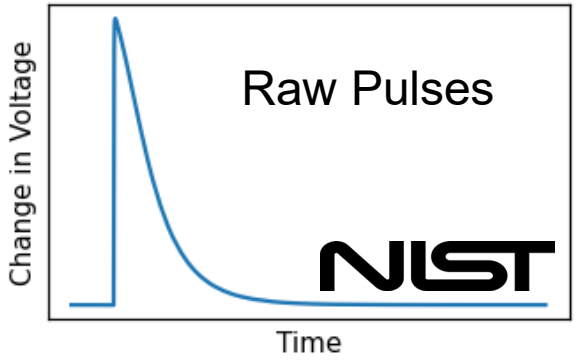


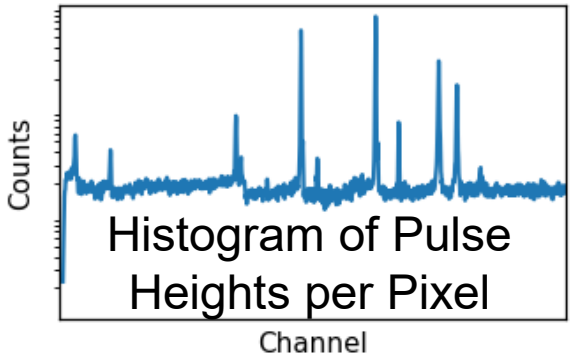


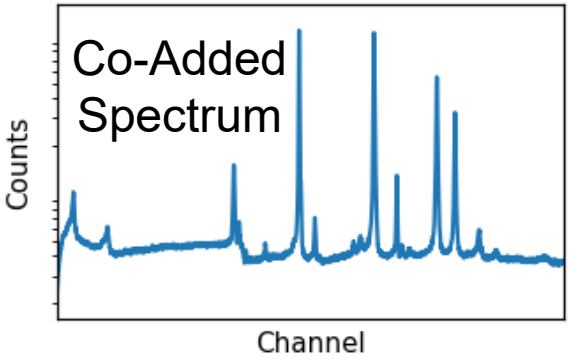


Energy-Calibrated Spectrum

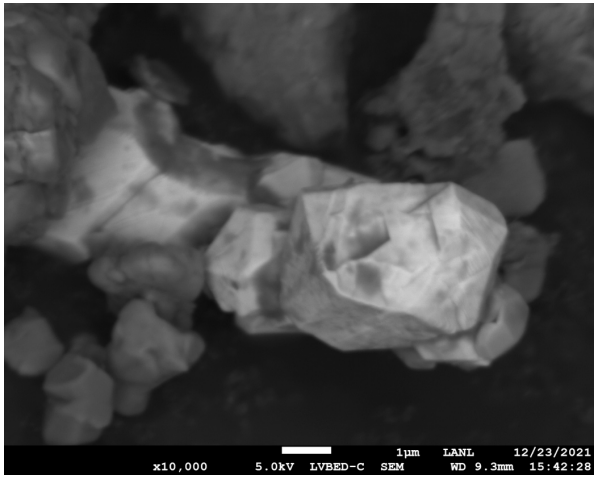
MicroMatcher

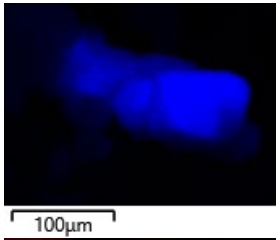


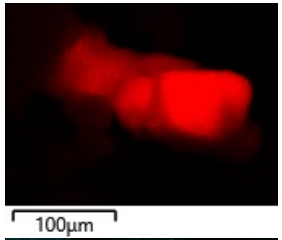


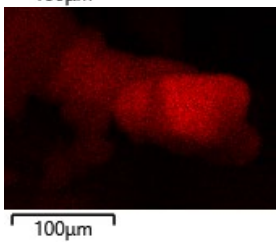


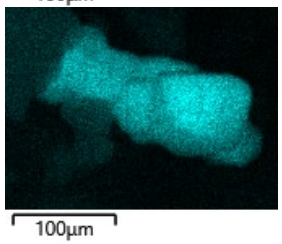
Next Generation Applications: Spatial Mapping

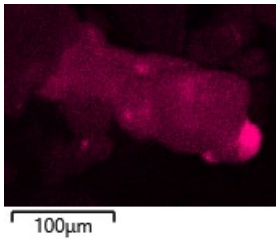












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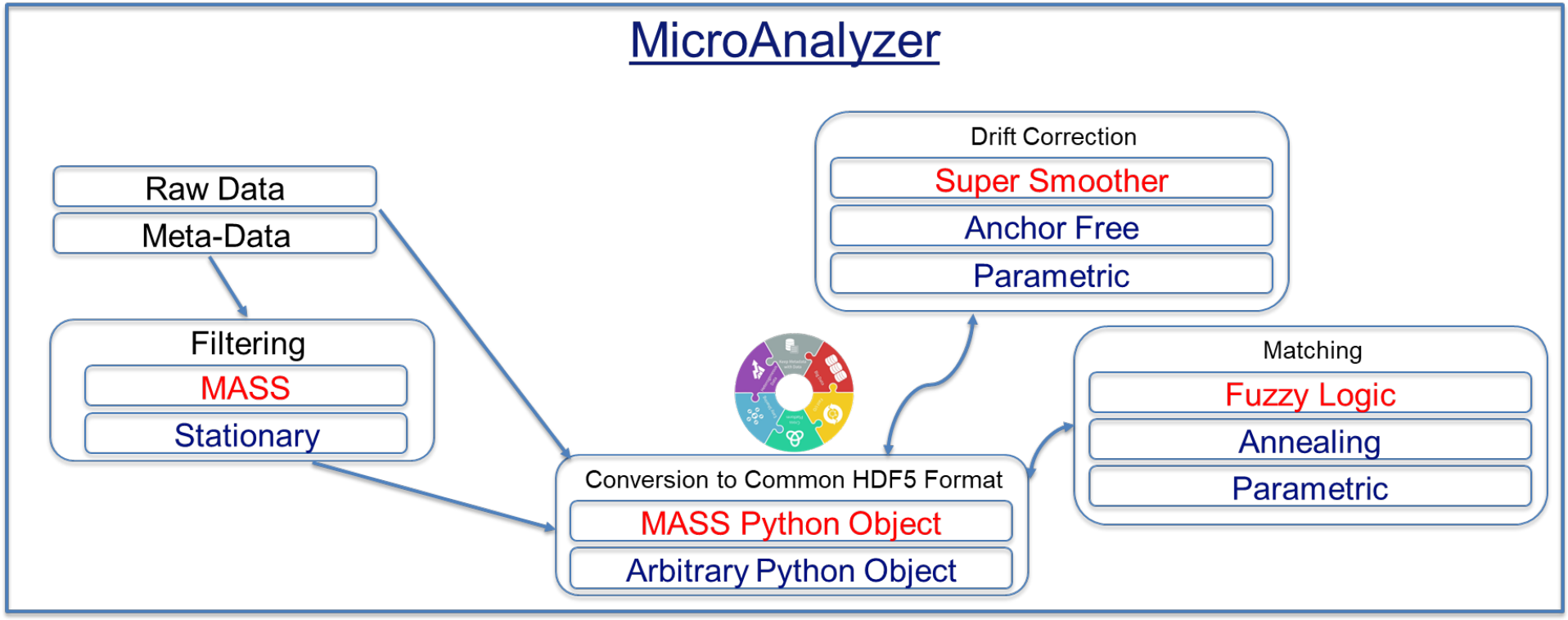
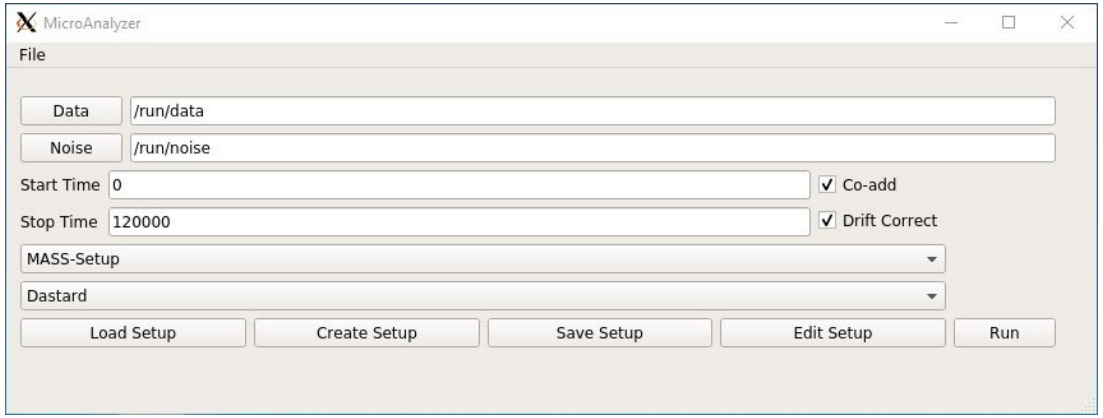
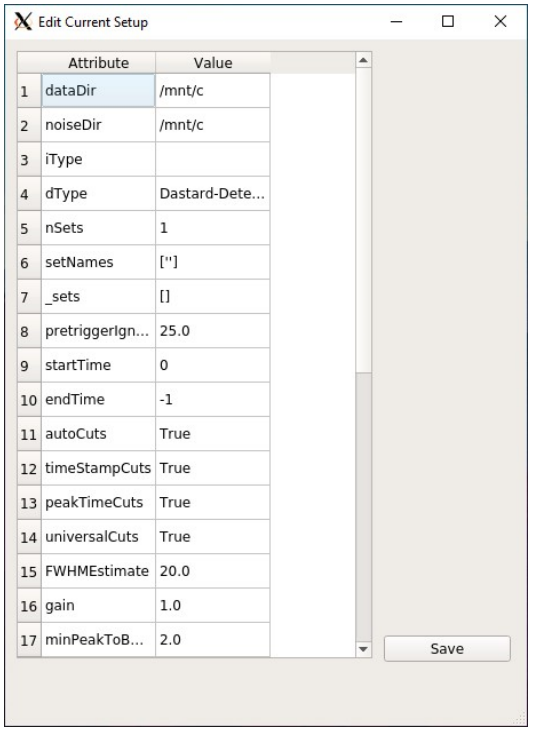
MicroAnalyzer

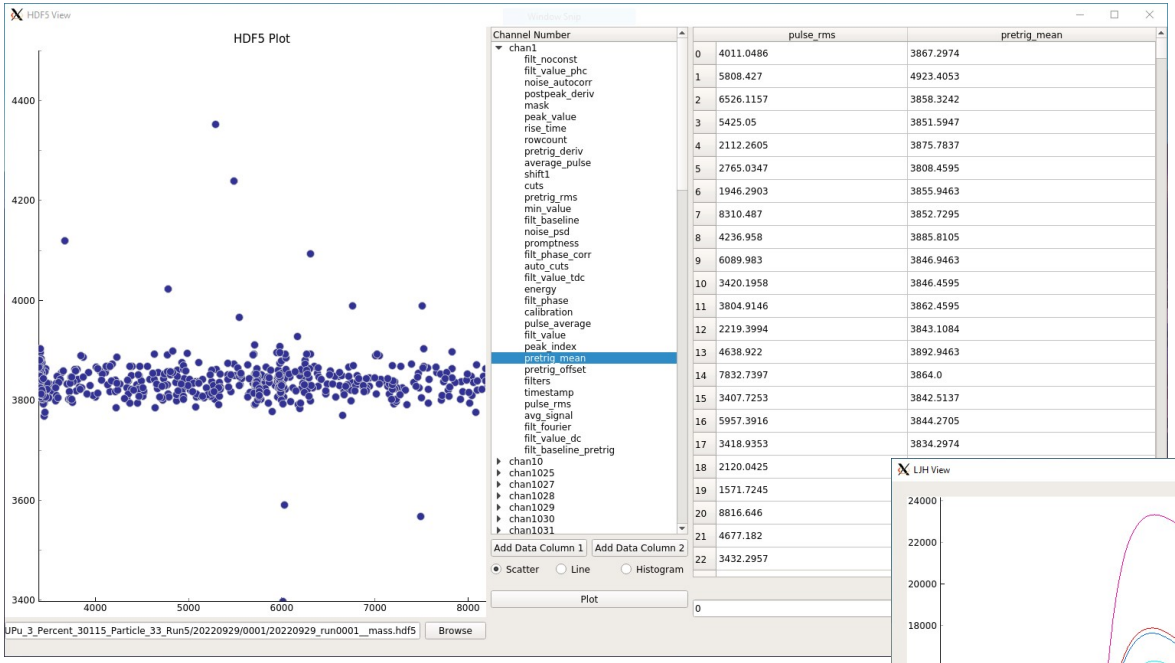


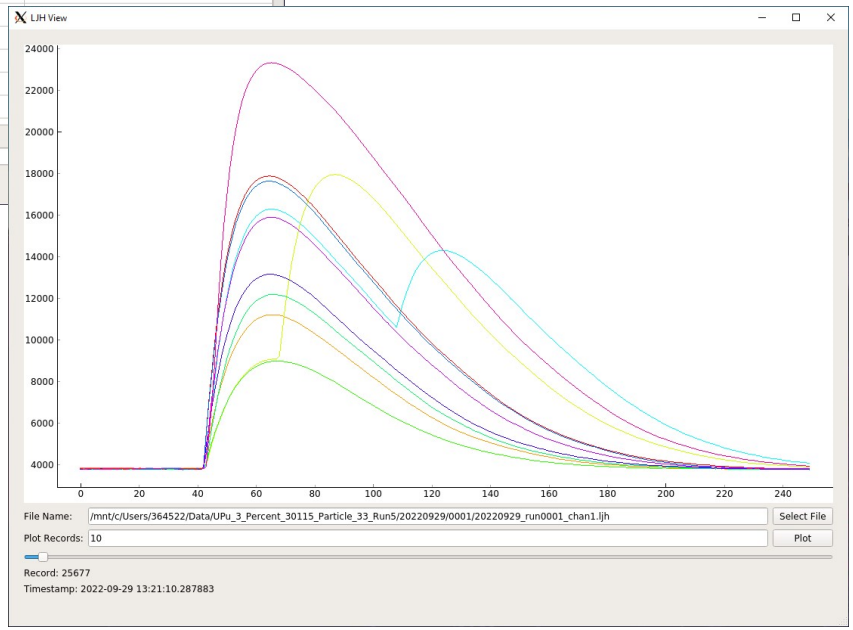
MicroAnalyzer UI



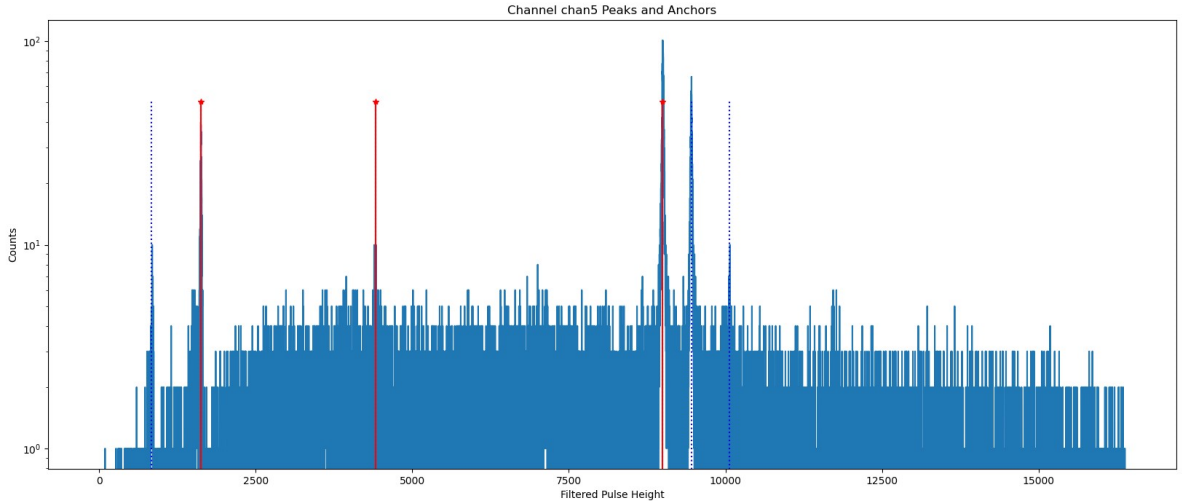


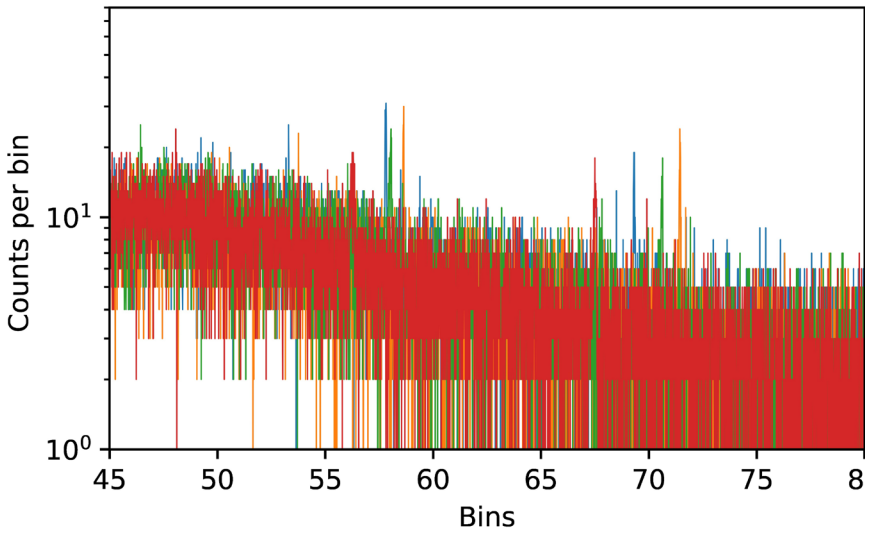
Analysis Tool Integration

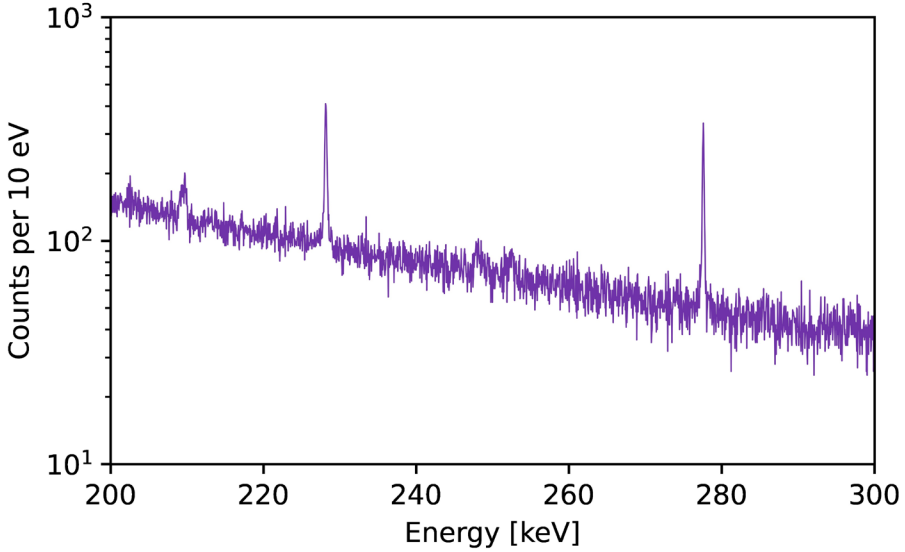




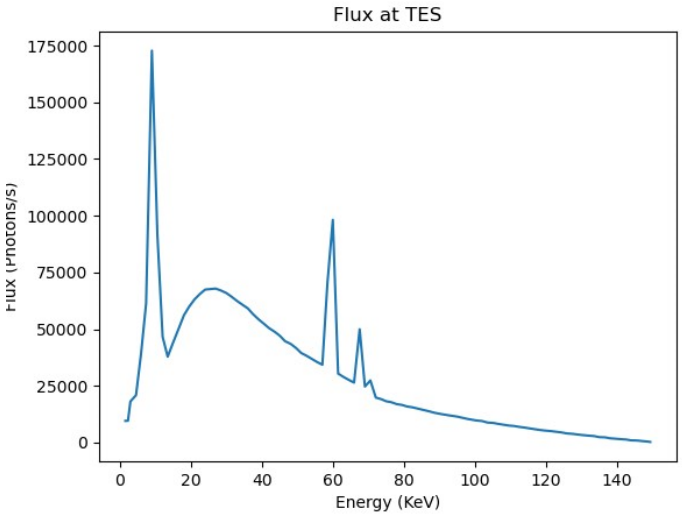
Diagnostics

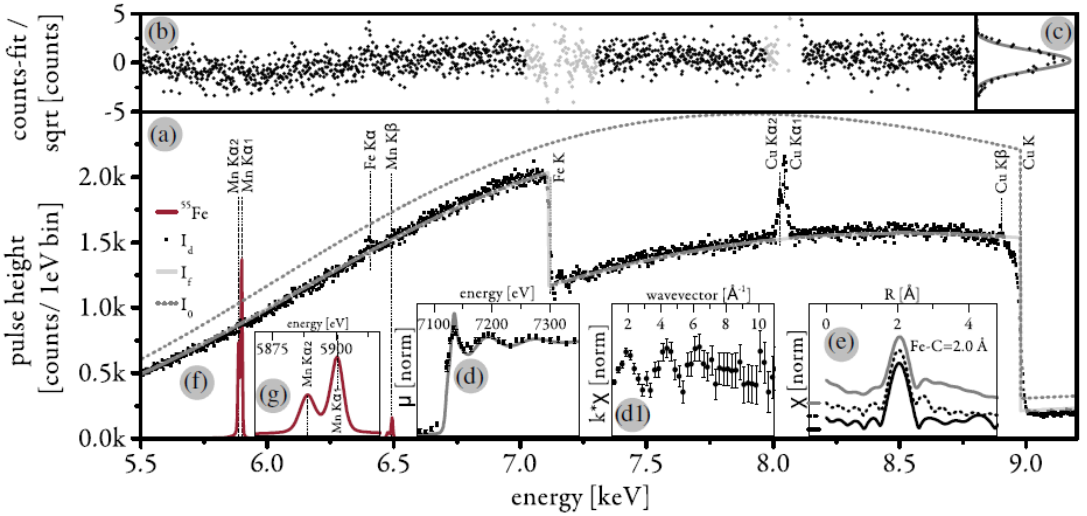


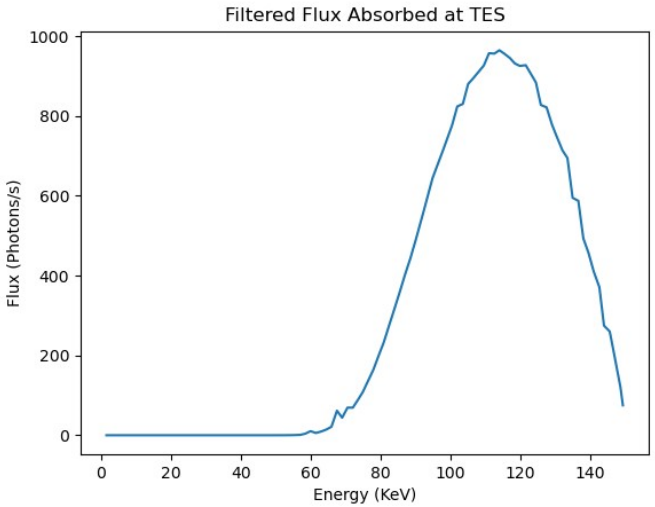


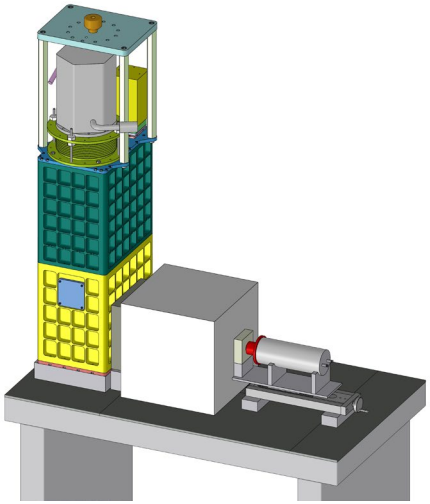


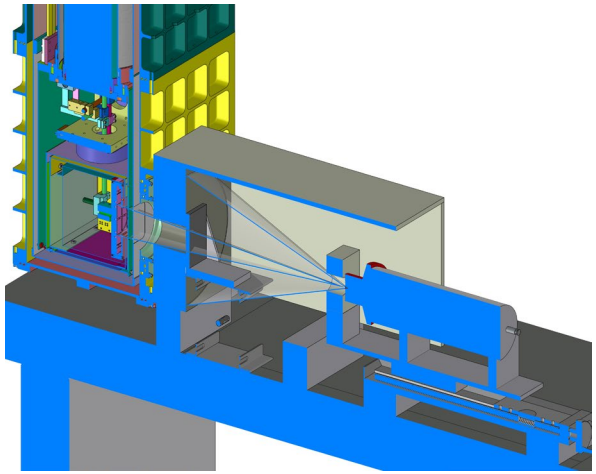
Next Generation Applications: EXAFS











Acknowledgments

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  - University of Colorado, Boulder
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  - Los Alamos National Laboratory
    - Laboratory Directed Research & Development

NIST

University of Colorado Boulder

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