



Update of the imaging capabilities of the biomedical imaging and therapy facility at the Canadian Light Source

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Abstract

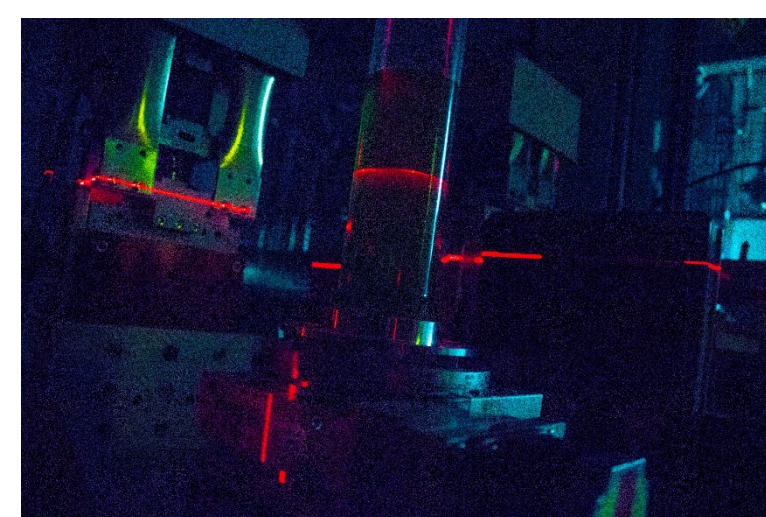
The BioMedical Imaging and Therapy (BMIT) facility provides synchrotron-specific imaging and radiation therapy capabilities [1-5]. There are two separate end-stations used for experiments: the Bending Magnet (BM) 05B1-1 beamline [3] and the Insertion Device (ID) 05ID-2 beamline [4-5]. There has been an active user program on the 05B1-1 beamline for the last four years and this is now expanding with the opening of 05ID-2 to higher energies (up to 120 keV) and a higher capacity positioning system (up to 450 kg). Imaging techniques available include: K-edge subtraction imaging (KES and spectral-KES), phase contrast imaging (PCI) and Diffraction Enhanced Imaging (DEI, also known as ABI) both in projection and CT modes. Looking forward, BMIT is adding new capabilities such as a larger vertical beam, faster detectors and access to higher energies.

BMIT Facility

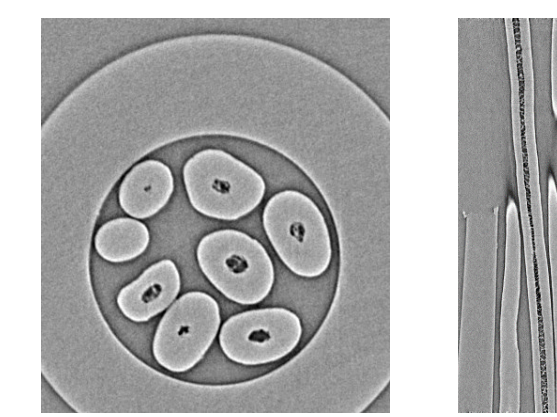
- Multiple End-stations
- Multiple Imaging Modalities
- Prep. Labs
- Expert Staff
- Wide Energy Range
- Data Processing
- Live Animal Imaging



Absorption and Phase Contrast projections and CT



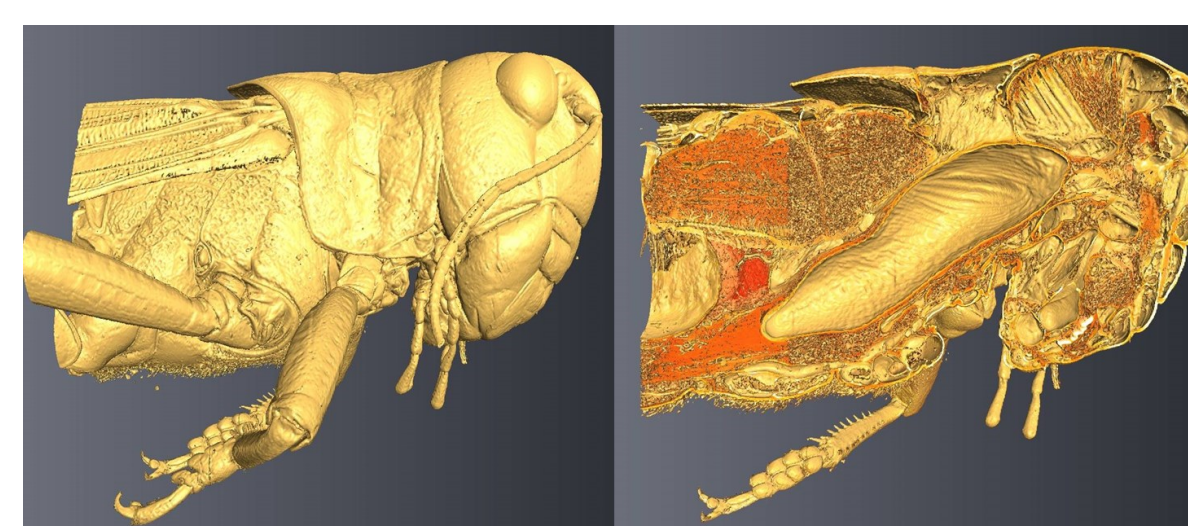
Absorption image of piglet



Polar bear hair



POE-2 sample stage



Muscles of a locust

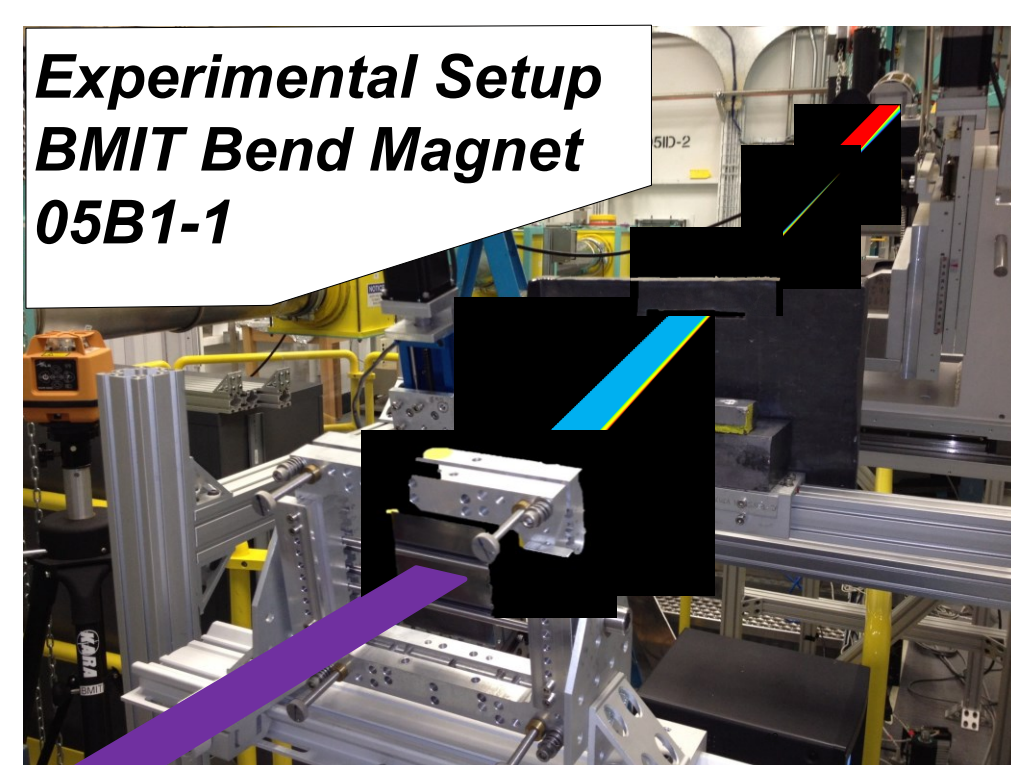
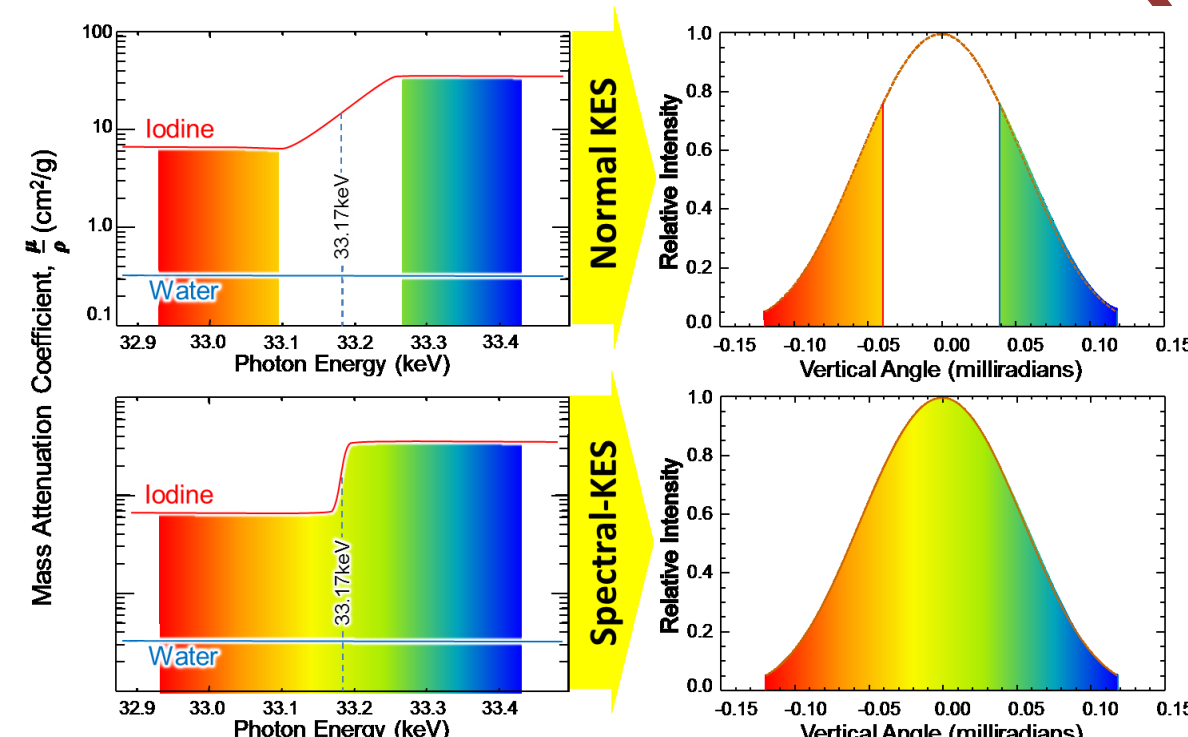
Absorption and phase contrast are standard methods for obtaining images including soft tissue information.



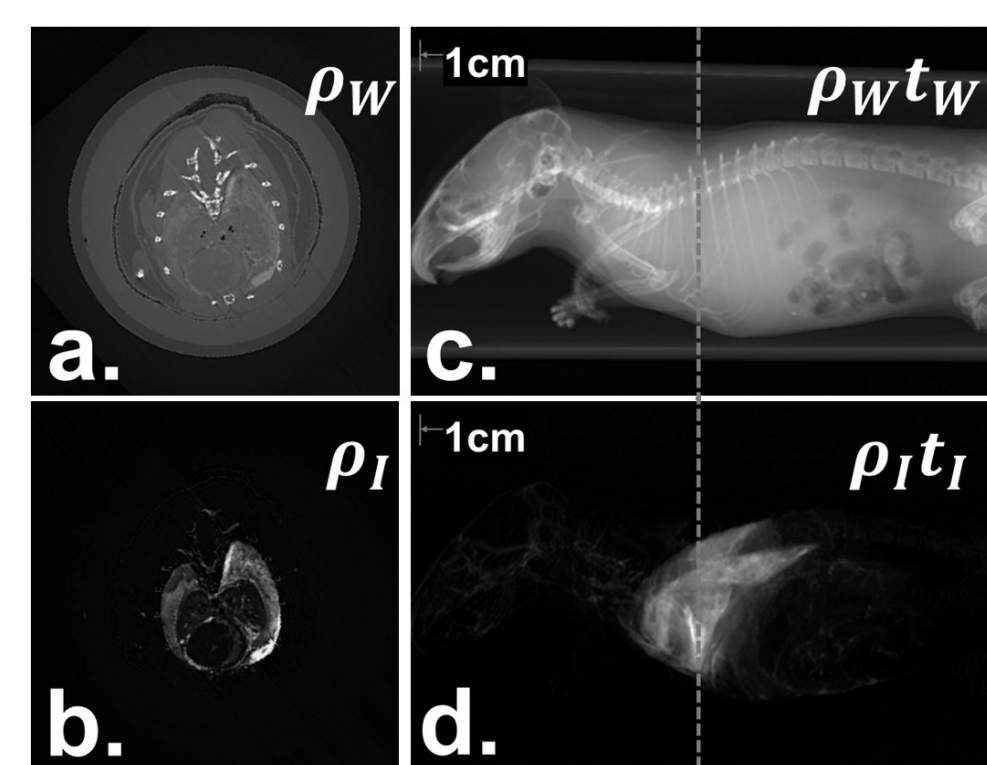
CT of coffee bean

K-Edge and Spectral K-Edge

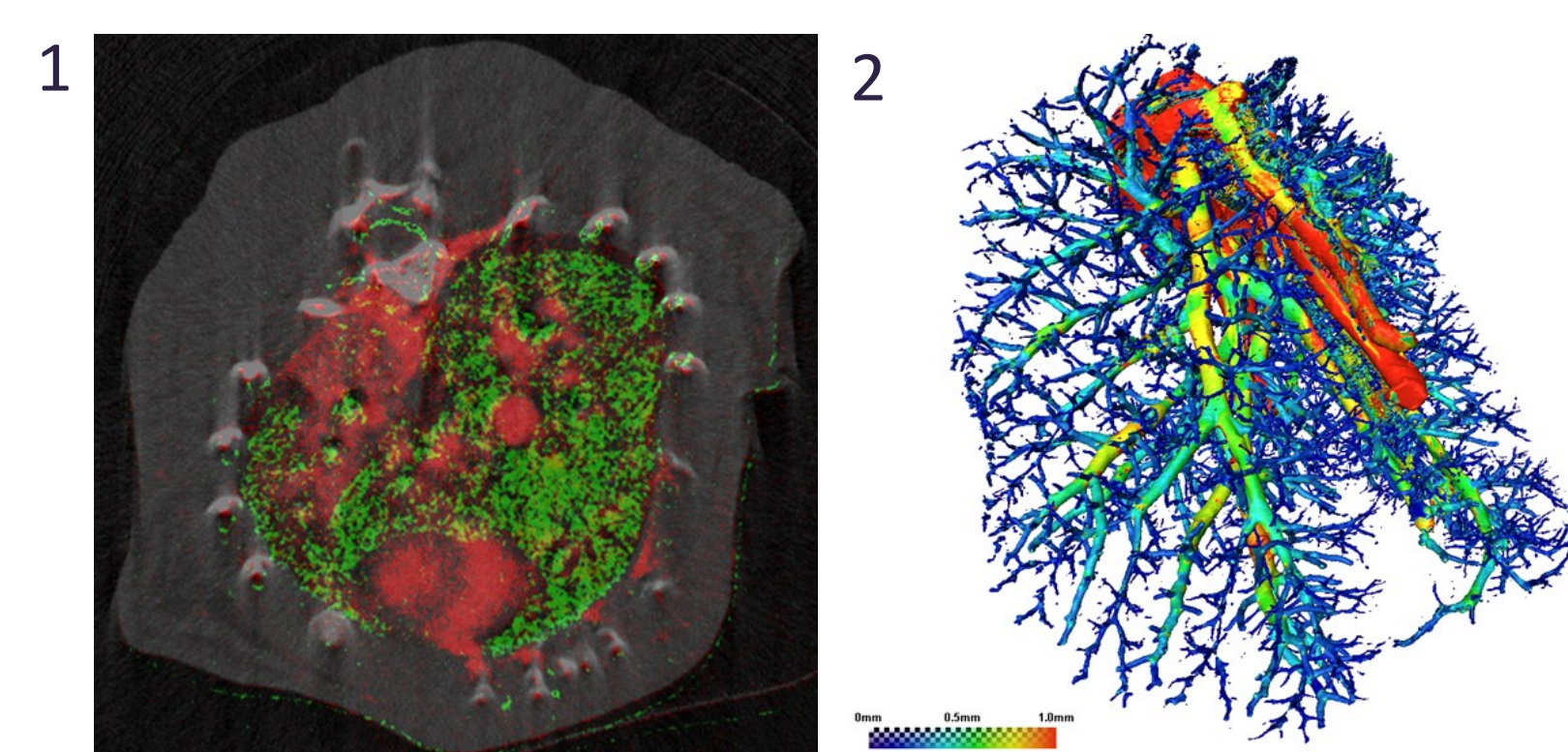
Use atomic absorption edges to make elemental specific images and CT scans. Scan at 2 energies or scan with many energies at once.



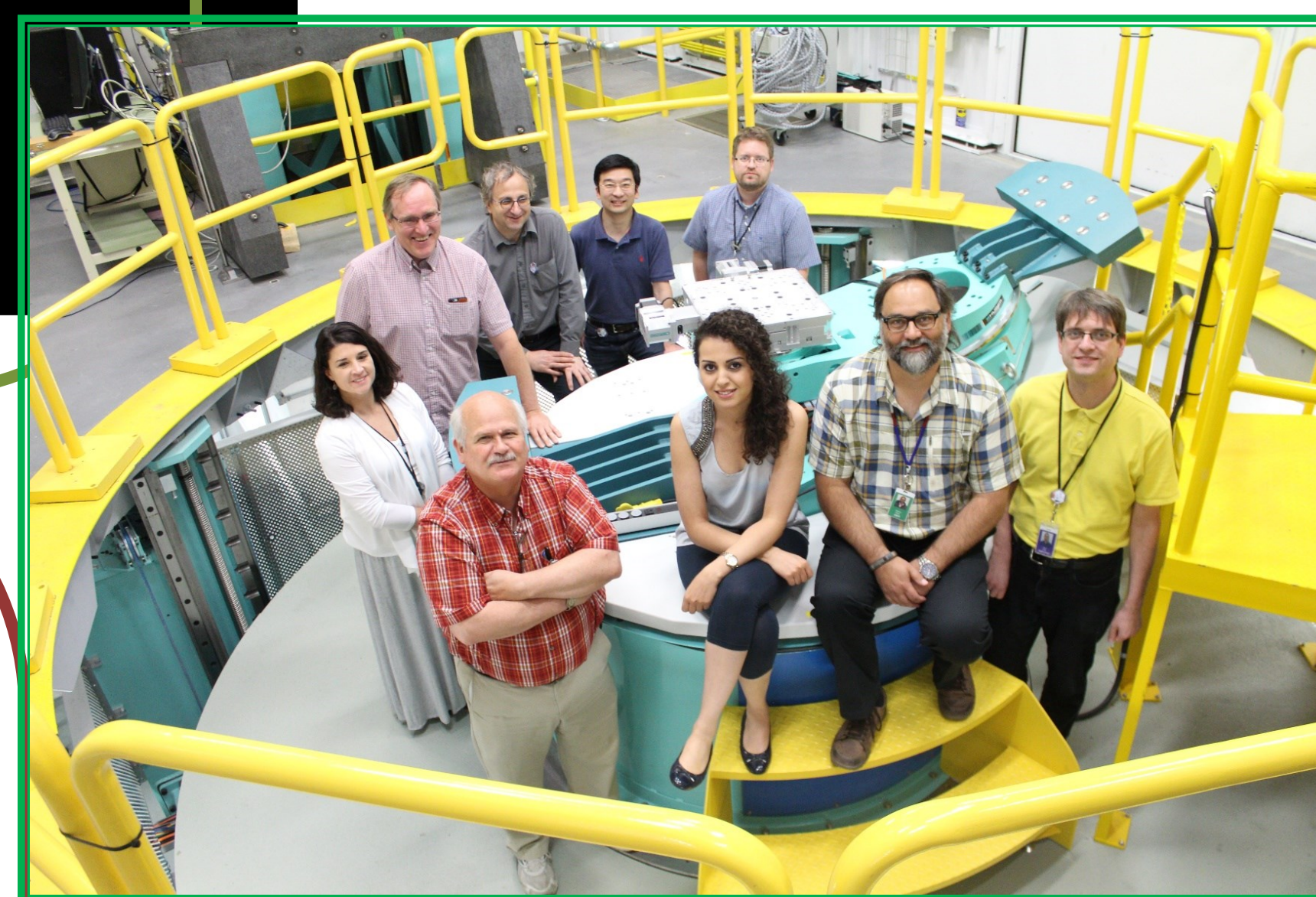
Set-up of bent crystal for spectral k-edge imaging.



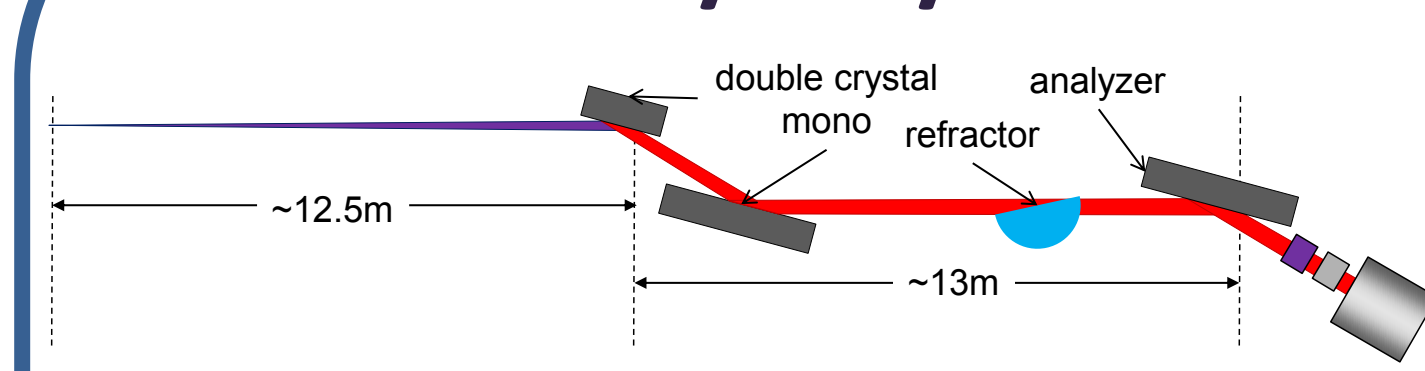
Iodine contrast injected into mouse for CT scan.



1. Iodine and Xenon distribution in lungs.
2. Distribution of microfill of lung at -80°C.

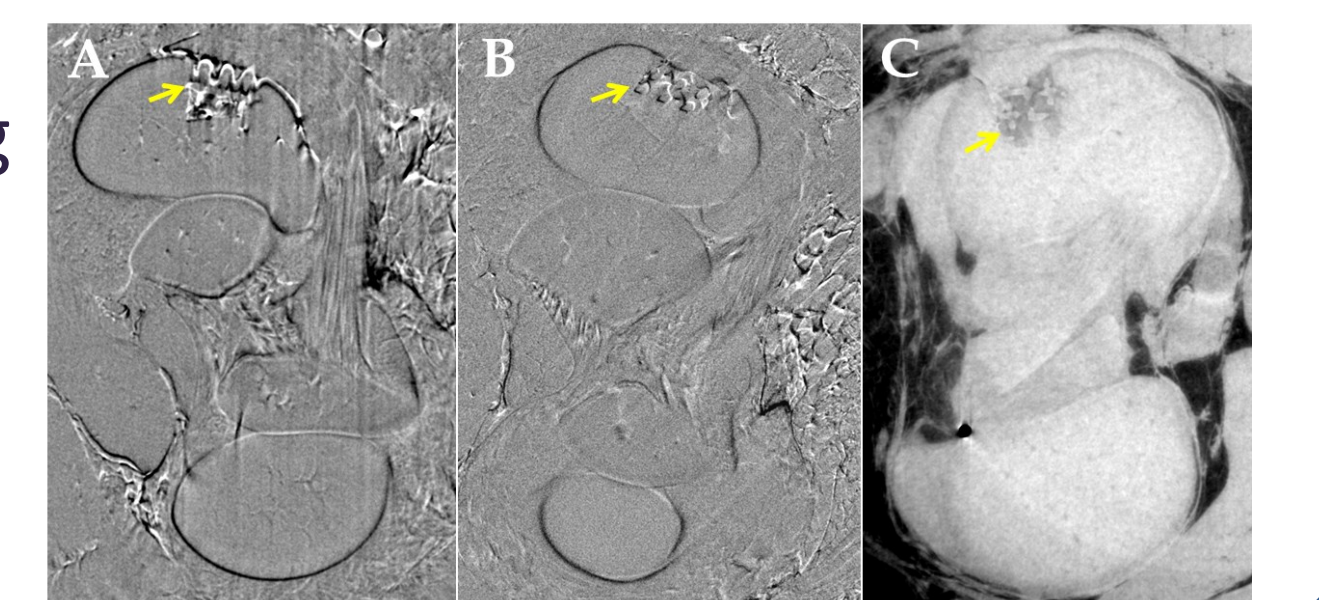


DEI/ABI/MIR

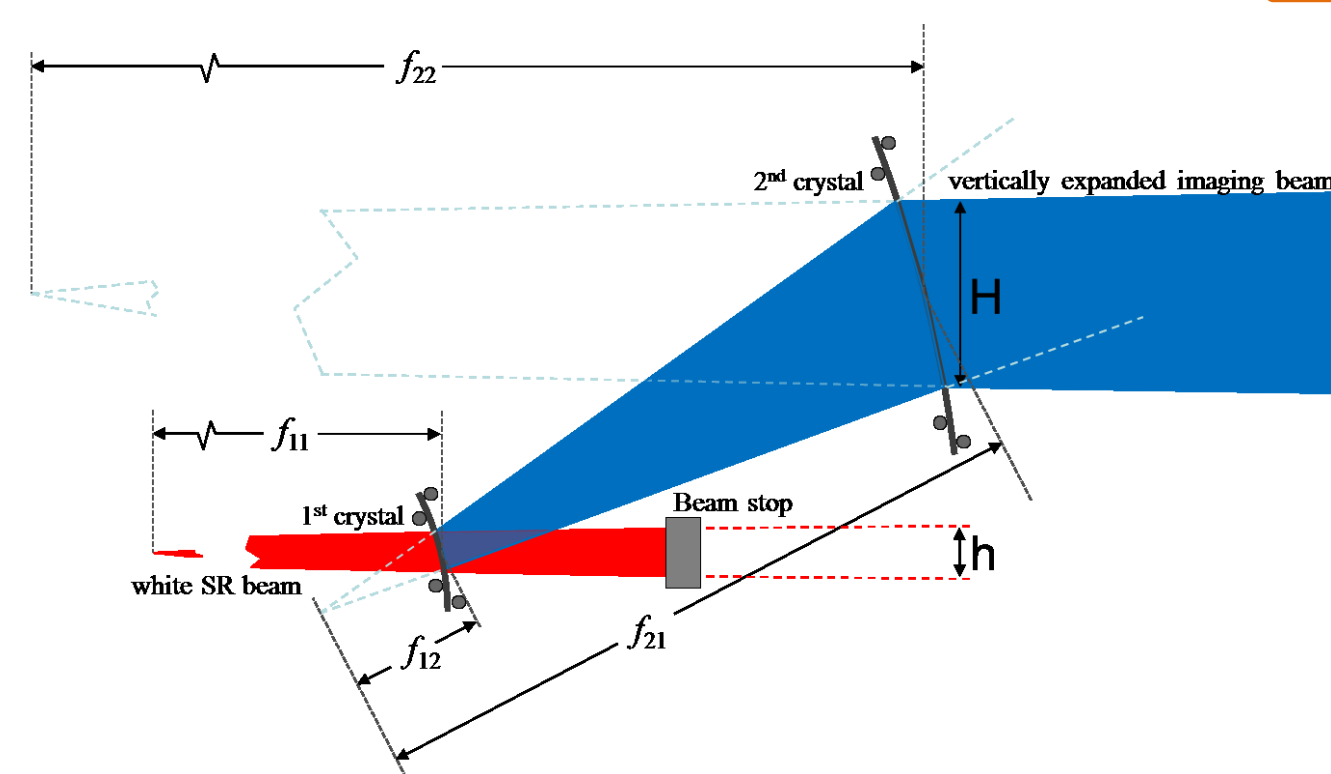


Use analyzer crystal to extract refraction and scattering.

Axial slice through a pig joint with scaffold.
A. CT-DEI,
B. CT-CT-ABI and
C. Phase contrast



Beam Expander



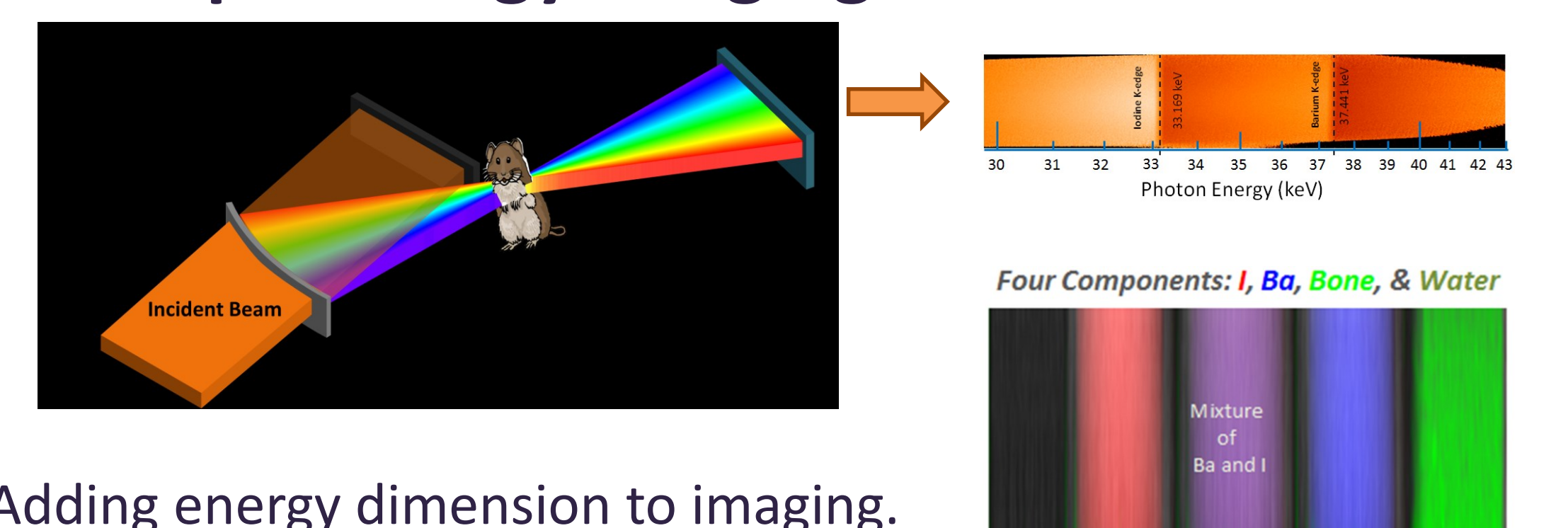
Expand beam height using bent crystal pair to better utilize detector area and use precious beamtime optimally.

Under Construction



Seed Pod

Multiple Energy Imaging



Adding energy dimension to imaging.



- All proposals are peer reviewed for scientific merit and ethical treatment.
- Software is used for data analysis and Visualization of results.



Movie Animation Presentation

References

1. Chapman LD, (2007) CLSI Doc. No. 26.2.1.1 Rev. 0.A
2. Chapman LD, (2006) CLSI Doc. No. 26.2.1.2 Rev. 0
3. Wysokinski TW et al. (2007) NIM A 582:73-76
4. Wysokinski TW et al. (2013) J. Phys: Conf Ser 425: 07
5. Wysokinski TW et al. (2015) NIM A 775:1-4.

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