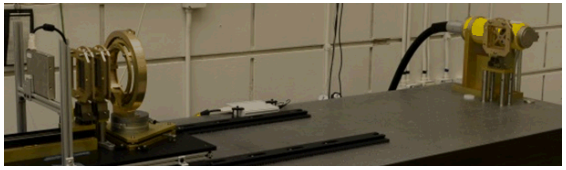
X-Ray Phase Contrast Imaging (XPCI)

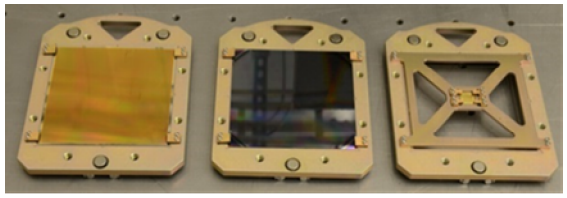
SAND2017-3658D

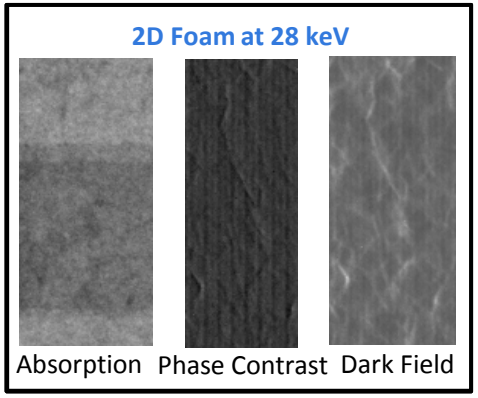
Sandia National Laboratories

Problem: Inspection of internal structure in low density materials

Goal: Non-destructive inspection using x-ray phase contrast imaging







Vision

XPCI as a state of the art ST&E capability that is widely disseminated and able to rapidly inspect components to asses and mitigate supply chain vulnerabilities; identify defects in low density components with high consequences of failure to improve levels of trust and assurance; employs image processing techniques to differentiate signals of interest

R&D Results

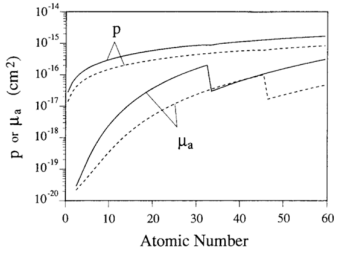
- Fabricated unparalleled large area, high uniformity, high aspect ratio gratings without support structures; enabling technology for lab-based XPCI
- Built grating-based XPCI system for 2D acquisition at 28 keV and demonstrated unique information obtained in materials science applications
- Will enable more rapid defect detection in low density materials that do not currently have non-destructive imaging techniques

R&D Goals

- *Develop a fabrication process for higher aspect ratio gratings to enable higher x-ray energy*
- *Implement 3D tomography and reduce data load through tomosynthesis*
- *Advanced acquisition algorithms and image processing for rapid sample evaluation*

Significance

- ***3 orders** of magnitude **greater sensitivity** over absorption imaging for low density materials*
- *3 complementary imaging modalities; **extract more information** about the sample*
- ***Defect detection** in low density materials that do not currently benefit from **non-destructive** imaging techniques*



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