MARS

Multimodal Advanced Radiography Station

High Flux Isotope Reactor

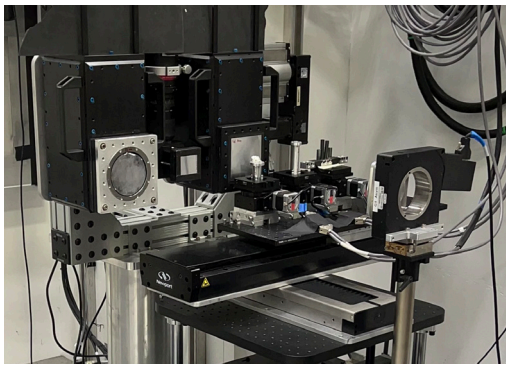
BEAMLINE

CG-1D

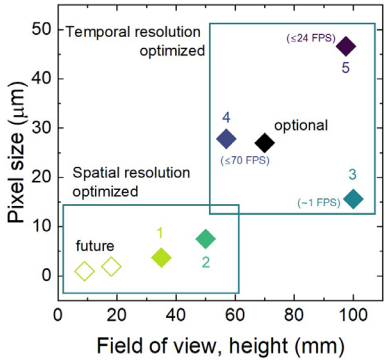
The MARS neutron imaging instrument, HFIR beamline CG-1D, provides a polychromatic beam of cold neutrons (peak wavelength 2.6 Å) to perform radiography and computed tomography. The facility provides a range of position-motorized apertures that can provide a collimation ratio L/D ranging from 80 to 2,000 (where L is the distance from the aperture of diameter, D, and where the radiograph is formed). The sample area is equipped with multiple translation and rotation stages, capable of performing automated tomography scans on three separate samples for each hands-on setup. Furthermore, the beamline is equipped with multiple detector systems to provide different combinations of spatial and temporal resolutions as well as various fields of view (FOV). White-beam neutron grating interferometry is available, which is sensitive to microscopic features ranging from ~40 nm to ~3,400 nm, calculated based on the peak wavelength.

SPECIFICATIONS

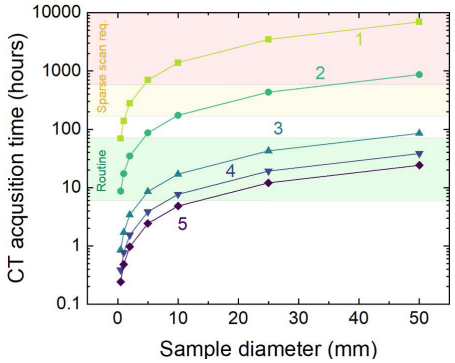
Wavelength range (Å)	$1 < \lambda < 9$
L (m)	1.29, 6.59
D (mm)	3.3, 4.1, 8.2, 11, 16
Wavelength resolution at 2.53 Å (with monochro-mator)	$\Delta\lambda/\lambda \sim 0.5$ %



Downstream detection systems and sample stages.



Detector systems' pixel sizes and fields of view. Maximum frame rates for full-frame images are shown in parentheses.



Estimated computed tomography acquisition time as a function of sample diameter for the five main detection systems. Acquisition times longer than ~72 hours may require sparse-view acquisition or experiment redesign.

APPLICATIONS

Energy Storage

- Ion transport in energy storage materials; three-dimensional mapping of ions in electrodes

Nuclear Materials

- Molten salt diffusion at high temperatures, inhomogeneities in nuclear fuel material

Transportation Technologies

- Particulate deposition in vehicle parts; two-phase transport in heat pipes; multi-phase constrained jet flows; metal casting

Plant-Soil-Groundwater Systems

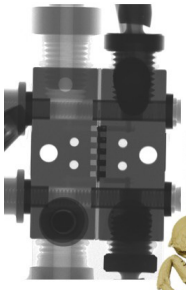
- Transport and interactions of fluids in porous media, water infiltration and aquifer recharge, plant-plant and plant-fungal interactions, change in pore structure and voids after repeated thawing and freezing of permafrost soil

Biological and Forensic Studies

- Structural, contrast agent, and cancer research; wood and biomass pyrolysis

Food Science and Archeology

- Water migration and degradation through time; examination of cultural artifacts



In-operando radiography of electrolysis (IPTS 34718)

High-resolution computed tomography of a carpenter bee (IPTS 27734)

For more information, contact

Yuxuan Zhang, zhangy6@ornl.gov, 865.341.0139
James Torres, torresjr@ornl.gov

neutrons.ornl.gov/mars

G020891/cpp_10-25

Managed by UT-Battelle LLC
for the US Department of Energy

OAK RIDGE National Laboratory