WK7: High-resolution 3D X-ray Imaging

Organizers: Si Chen, Doga Gursoy, and Vincent de Andrade (APS/ANL)

Many science areas have been revolutionized by the use of high-resolution x-ray tomography. Both the structural information and elemental/chemical or magnetic distribution can be revealed in 3D in a non-destructive fashion. These studies have been further advanced by combining tomography with the development of scanning nanopores and full-field systems like transmission x-ray microscopy (TXM) or projection microscopes, with spatial resolution routinely operated at sub-100 nm and expected to approach sub-10 nm in the case of coherent diffraction imaging techniques after the upgrade of the storage rings with the multi-bend achromat lattice at the APS and other light sources. As the spatial resolution approaches nanoscale, new challenges arise due to the limitations in various aspects, including instrument stability, measurement precision, rotation stage runout, and shallow depth of field of focusing optics. Both instrumentation and novel methods in data collection and processing are essential to realize the potential of high-resolution 3D imaging. This workshop will serve to strengthen collaborations among the synchrotron x-ray nanoimaging community to elevate high-resolution 3D x-ray imaging beyond demonstration stage, and make it practical for routine user operations.