Scanning mapping of biological tissues using scattering contrast

Lin Yang[1], Jiliang Liu[2], Shirish Chodankar[3], Stephen Antonelli[4]

[1]Brookhaven National Laboratory [2]Brookhaven National Laboratory, [3]Brookhaven National Laboratory, [4]Brookhaven National Laboratory

lyang@bnl.gov

We report the instrumentation and software for microbeam scattering and structural mapping at the Life Science X-ray Scattering (LiX) beamline at NSLS-II. Using a two-stage focusing scheme, we produce an adjustable beam size between a few microns and a fraction of a millimeter at the sample position. Scattering data at small and wide angles are collected simultaneously on multiple Pilatus detectors. A recent addition of a Pilatus 900K detector, with the detector modules arranged in a C-shaped configuration, improves the azimuthal angle coverage in the wide-angle data. Fluorescence data can be collected simultaneously. Fly scans have been implemented to minimize time interval between data frames and unnecessary radiation damage to the sample. For samples that do not produce strong scattering, we have developed an in-vacuum sample environment to minimize background scattering. Data processing for these measurements is highly sample-specific. We have implemented a python library that helps users reduce data into reciprocal coordinates, from which they can then quantify features from these intermediate data and construct structural maps. Research examples will be presented.