GOAL: The beamtime was dedicated to commissioning an upgrade setup for frozen-hydrated x-ray diffraction microscopy (cryo-XDM) to improve the data quality for high-throughput imaging and to demonstrate the three-dimensional data collection. This upgrade is needed to advance cryo-XDM capability toward 3D imaging which can address biologically relevant issues.

RESULT: We successfully commissioned the upgrade instruments at ID10C in collaboration with beamline scientist and BLISS group. Figure 1 shows the picture of cryo-stage setup. A GUI program developed by BLISS GROUP aided locating sample loops and aligning samples with a rotation axis which reduced the risk of sample damage. The beamtime was primarily dedicated to run a pilot experiment to commission the instruments and software. After commissioning the setup, during the limited time available, we collected preliminary full 3D diffraction data from a frozen-hydrated sample, ranging from -65 degree to +55 degree with a total beamtime of ~24 hours.

OUTLOOK: The setup is ready for future 3D cryo-XDM.

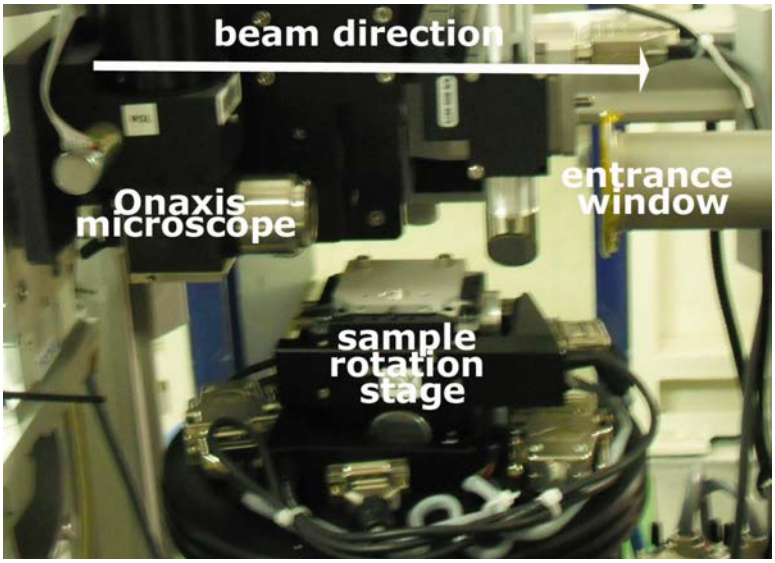

Figure 1. The upgraded frozen-hydrated sample stage with 3D data collection capability.

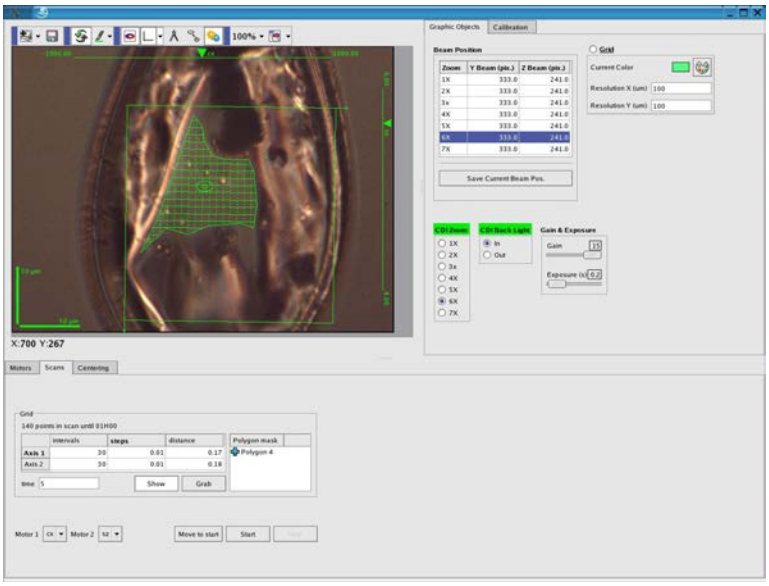

Figure2. A GUI program, developed by BLISS group, for cryo-XDM experiment.

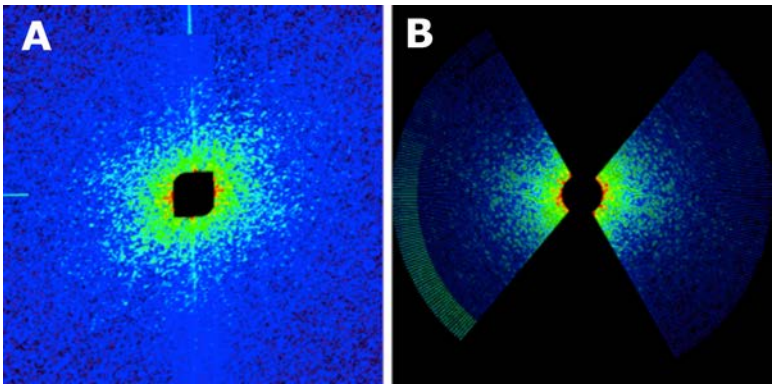

Figure 3. 3D data cube from frozen-hydrated *D. radiodurans*. (A) shows the diffraction plane (xy plane) normal to the beam (in z axis). (B) corresponds to a plane parallel to the x-ray beam (xz plane).