

down to slightly below 6 keV, the F3 station, with multilayer optics, presents another option; see sidebar.

Station upgrades

A number of changes have been made to improve users' productivity and comfort:

- Robust safety shields which open and close automatically.
- Motorized detectors which roll back automatically when a hutch is opened, and which can be moved using **ADX**.
- Up-to-date computing hardware and software, including an extensive collection of standard crystallographic software.

References:

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Station F3

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The F3 station is shared between CHESS (e.g. x-ray topography studies, x-ray imaging, x-ray fluorescence) and MacCHESS (macromolecular crystallography). Darren Dale, the responsible scientist for CHESS, maintains all beamline components up to the hutch and is currently working on further enhancements. The station supports a variety of monochromators: Si or Ge crystals as well as multilayers of various bandwidths. For macromolecular experiments the new 0.22% multilayers are used. Recent improvements in the monochromator box now allow users to tune the energy between 5.9 and 15.4 keV (2.1 Å – 0.81 Å). This range spans the K and L edges of most commonly used elements for anomalous dispersion experiments.

In the hutch CHESS and MacCHESS have rolling setups on separate optical tables for quick and easy switch-over. A new 1.5m optical table has been designed for crystallographic purposes; it supports all experimental components on one platform. This greatly facilitates alignment procedures and overall stability. It also gave CHESS the opportunity to install a new "integrated motion controller and drivers unit" for the table motors, which is much more compact than the old controller. In addition, the 32 bit workstation for data collection and processing has been replaced with a modern 64 bit Linux based system similar to those at other MacCHESS beamlines.

The station has been used mainly by MacCHESS personnel, the Crane group from Cornell and the Cingolani group from Upstate Medical University. Recent experiments at the station examined samples that contain anomalous scatterers, e. g. Xe, Fe and S. The results show that we can obtain an anomalous signal from an element as weak as sulfur, with data collected at 7.1 keV. Due to the increase in flux with the 0.22 % multilayer monochromator, data collection times were significantly shorter (~ 5 times) compared to a data set taken from a similar sample at the F2 beamline. As an example of the quality of anomalous data from F3, the figure shows an anomalous difference Fourier map from horse hemoglobin, after refinement, contoured at 4 σ . The region depicted includes both heme groups and their protein surroundings. Large positive peaks (blue) appear at the positions of the iron atoms in the center of the hemes, and smaller peaks are visible for sulfurs, e. g. in the disulfide bond located slightly above and to the right of the left-hand Fe.

