

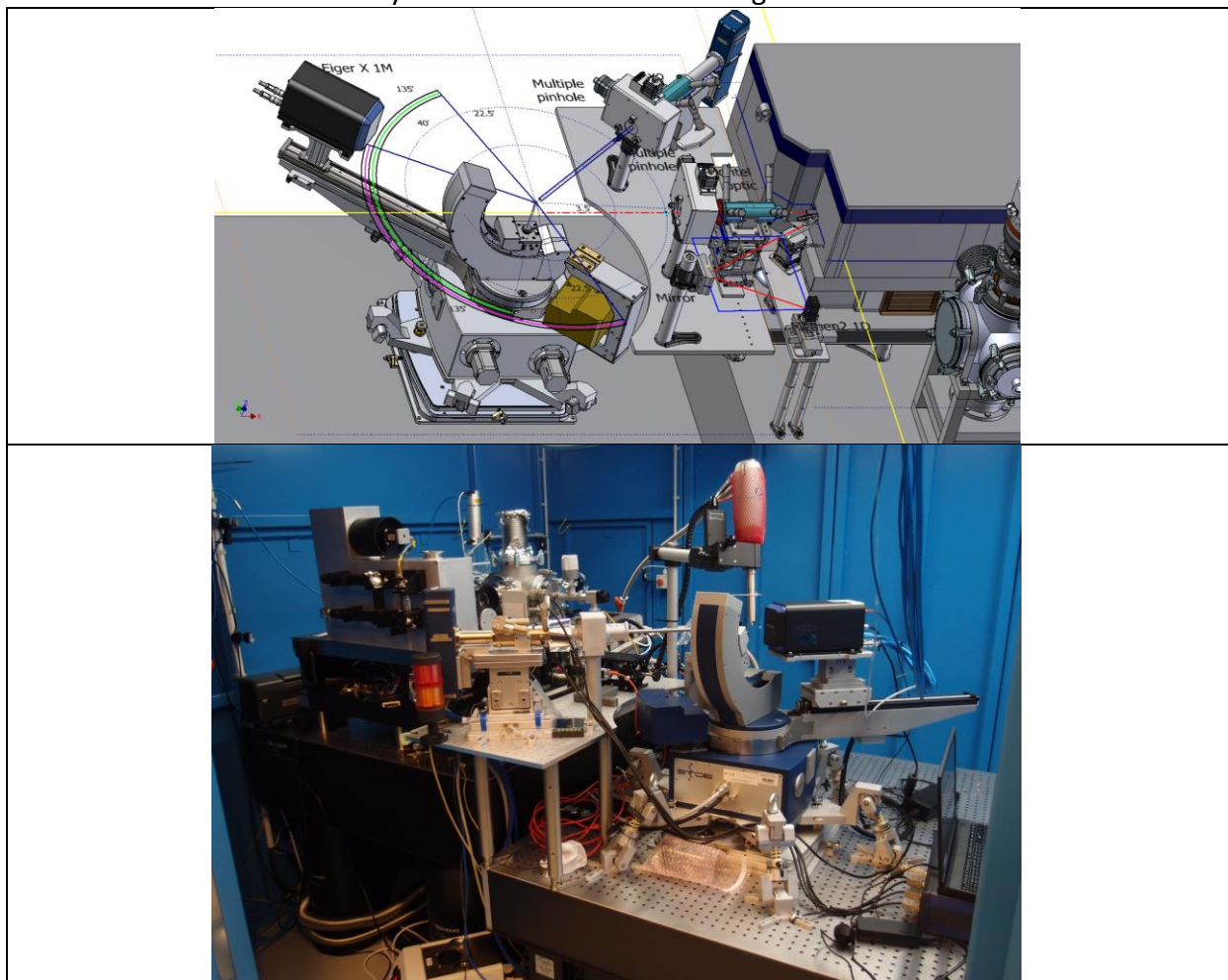
TREX: X-ray diffraction and/or scattering experiments using the complementary sealed tube X-ray source

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Brief description of the available set up:

The X-ray diffractometer is based on a custom modification of a commercial STOE STADIVARI goniometer. It has the same functionality as the commercial analog plus in addition an extended range for the detector movement going up to 400 mm sample to detector distance. The main module of the diffractometer is the so called Euler cradle goniometer, which is capable of simultaneously rotating the investigated sample at 360 degree and at the same time to position the X-ray detector at desired angle and distance from the sample. It comes with a computer controlled video microscope and dimmable led light. The cryo cooling for the fragile biological sample is implemented via a commercial cryo stream cooler from Oxford Cryosystems. The recording of the diffracted and scattered X-ray photons is accomplished by a single photon counting hybrid pixel detector model Eiger X 1M from Dectris company. Another module is the X-ray microfocus sealed tube with Montel optics and JJ X-ray pinhole collimation.

The instrument for hard X-ray science is outlined in the figure below.



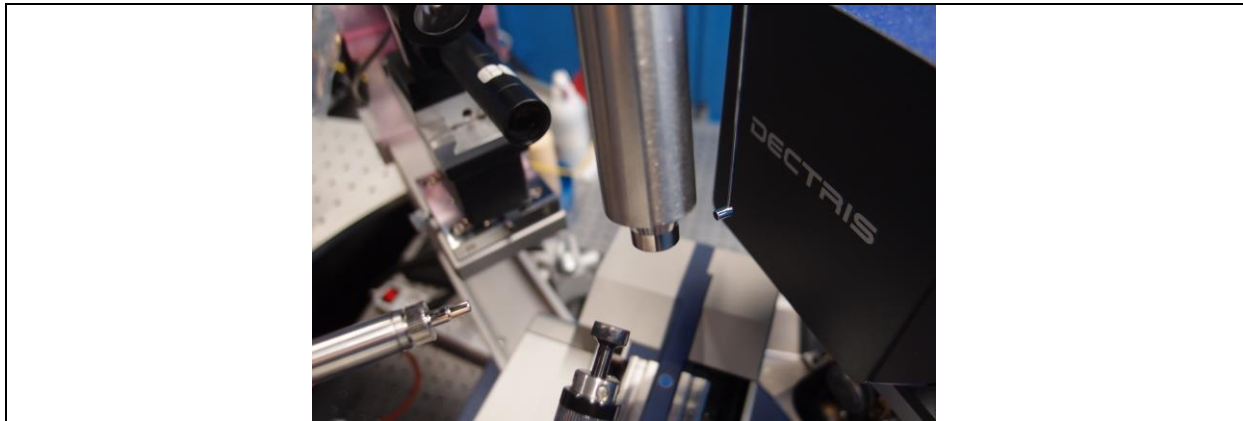


Fig. Top: Hard X-ray experimental station as designed, including the laser driven Plasma X-ray source, a complementary sealed tube Cu-anode X-ray source, diffractometer and von Hamos spectrometer for absorption spectroscopy (not available for call 1 users). Middle: Diffraction station as built (presently available for users with the complementary sealed tube X-ray source). Bottom: detail of the diffractometer sample environment when optimized for protein crystallography with the cryostream cryocooler.

Technical Data

<i>Sealed tube X-ray beam parameters</i>	
Flux on the sample	10 ⁸ ph/sec
Beam size	145 micrometers
Beam divergence	4.8 mrad
Beam polarization	40%
Wavelength	CuKa 1.54 Angstroms
<i>Detector parameters</i>	
Pixel size [μm ²]	75 x 75
Sensitive area (width x height) [mm ²]	77.2 x 79.9
Total number of pixels	1030 x 1065 = 1,096,950
Maximum frame rate [Hz]	3000
Frame dead time	3 μs
Point-spread function	1 pixel
Sensor thickness [μm]	450
Threshold energy [keV]	2.7-18
Maximum count rate [phts/s/mm ²]	5x10 ⁸
Counter bit depth [bit]	12
Image bit depth [bit]	16 or 32
Photon processing time per pixel	180 ns
Data format	HDF5
Sample to detector distance	40-400 mm