Capabilities and Upgrades of the I15 Beamline at Diamond Light Source for XRD at Extreme Conditions

M. Abdellatief[1], E. Koemets[1], X. Liu[1], B. Ghosh[1], A. Ross[1], D. Daisenberger[1], A. Kleppe[1]

Diamond Light Source, Diamond House, Harwell Science and Innovation Campus, Fermi Ave, Didcot OX11 0DE, UK

mahmoud.abdellatief@diamond.ac.uk

The I15 beamline at Diamond Light Source is dedicated to high-energy X-ray diffraction under extreme conditions, enabling structural studies at high pressure and high temperature. The beamline supports single-crystal diffraction, powder diffraction and pair distribution function (PDF) analysis, addressing a wide range of applications in materials science and Earth and planetary sciences.

I15 operates over the energy range 20–80 keV using a 3.5 T superconducting wiggler source, delivering more than 10^{11} photons/s at the sample. Flexible beam delivery allows experiments ranging from millimetre-scale samples to micro-focused diffraction on samples only a few micrometres in size. Extreme pressures are achieved using diamond anvil cells, combined with laser-heating systems enabling temperatures above 1000 K, with diffraction data collected using a Pilatus3X CdTe 2M detector.

Ongoing developments include upgrades to sample environments and instrumentation linked to the Diamond-II programme, including a new double-crystal monochromator to accommodate increased beam power. These upgrades will further enhance the performance of I15 for extreme-conditions X-ray diffraction experiments.

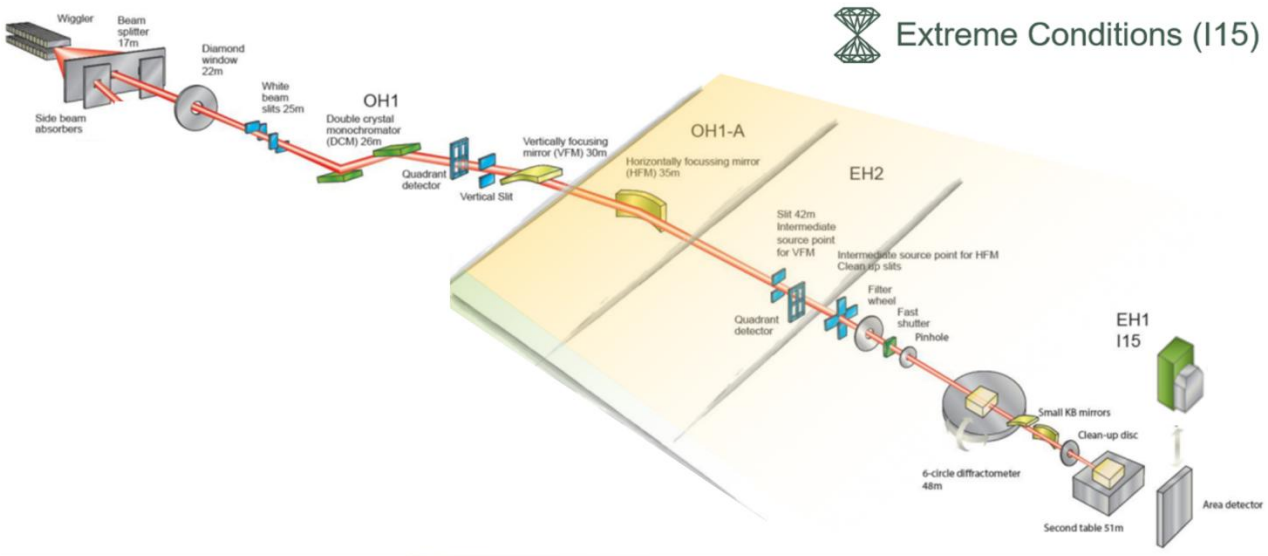


Figure 1. *I15 beamline layout for extreme conditions X ray diffraction*