Poster

The materials and magnetism beamline, I16 at diamond light source Ltd

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I16 is a high flux, high resolution x-ray beamline based at the Diamond Light Source. The beamline operates in the 2.7-15 KeV range and it is a diffraction facility optimized for the study of resonant and magnetic scattering processes from single crystal samples [1]. Resonant elastic X-ray scattering is ideal to characterize electronic, magnetic, and structural properties of materials thanks to the enhanced sensitivity to otherwise weak scattering processes providing spectroscopic information and chemical selectivity. I16 main instrument is a large 6-circles K-diffractometer able to accommodate a variety of ancillary environment. The beamline offers full control of the incident photon polarization over most of its energy range. This is combined with large photon counting area detectors and an in vacuum linear polarization analyser installed on the K diffractometer that is used to isolate and enhance specific scattering processes related to ordering phenomena.

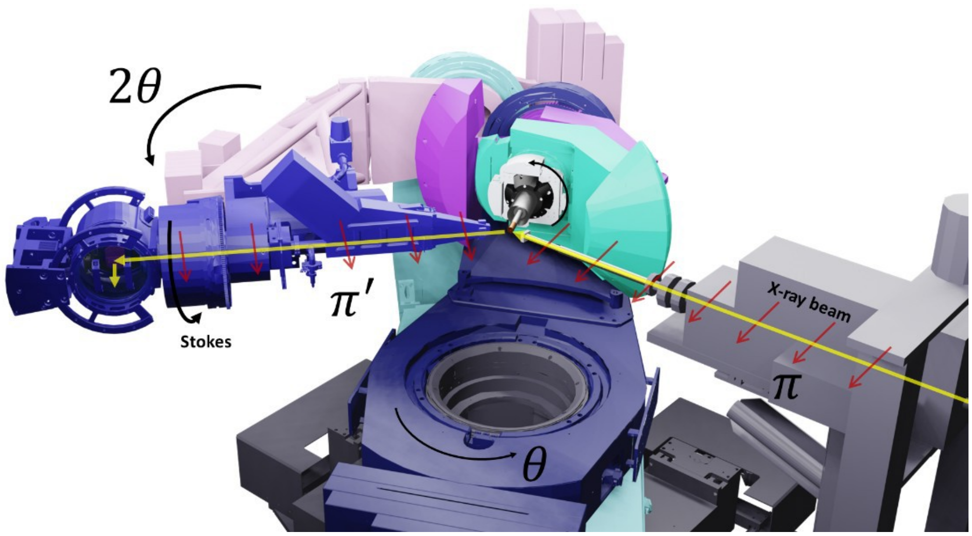

Figure 1. Illustration of the 6-circle kappa diffractometer and polarisation geometry

Using circular light of opposite helicity allows the investigation of chiral magnetic structures, inversion domain in multiferroic materials and permits to separate collinear and non collinear magnetic textures in real and reciprocal space. Other phenomena routinely investigated on I16 include charge density wave, metal-insulator transitions, orbital ordering, and subtle structural transitions. The beamline has been highly successful in examining weak scattering phenomena in small crystals, films, and multilayers between 6-800 K, often in combination with other generalised thermodynamic variables like electric or magnetic fields, and strain [2- 5]. X-ray Bragg Coherent Diffraction Imaging is also possible at the beamline and allows researchers to peer into the inner structure of nanocrystals, with unparalleled detail and resolution by recording the interference patterns resulting from the interaction of a coherent beam with the lattice.
In this poster presentation, some of the new capabilities and features of the beamline will be shown, and recent results establishing the capabilities of the beamline will be highlighted.

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[4] Porter, D.G., Forte, F., Granata, V. et al. Sci. Rep. 12, 10957 (2022).

[5] Nisbet, A. G. A. et al. Phys. Rev. Materials 5 (2021)