

Large beam X-ray Photon Correlation Spectroscopy

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The Coherence Beamline P10 at PETRA III is dedicated to coherent X-ray scattering experiments using X-ray Photon Correlation Spectroscopy (XPCS) and Coherent Diffraction Imaging (CDI) techniques.

Mostly, the beamline operates in the energy range of 5-17 keV. It consists of two 12 m long experimental hutches (EH1 & EH2) which house various experimental setups. Here, we present the large beam XPCS setup at P10. In this configuration, the sample position is situated in the first experimental hutch (EH1), while the detector is positioned at the end of the second hutch (EH2), which results in a sample to detector distance of around 21.3 m. This long pathway allows it to use a large fraction of the horizontal coherent flux in an unfocused X-ray beam, while providing a fairly strong speckle visibility at 8 keV using a pixel size in the range of $(75 \mu\text{m})^2$. The setup is therefore ideally suited for radiation sensitive samples such as most complex liquids, as the flux per sample area can be considerably reduced using a comparatively large X-ray beam.

At a photon energy of 8 keV, the minimum accessible q is around $2 \times 10^{-4} \text{ \AA}^{-1}$. To illustrate the possibilities for XPCS in this configuration, recent experimental results will be displayed.

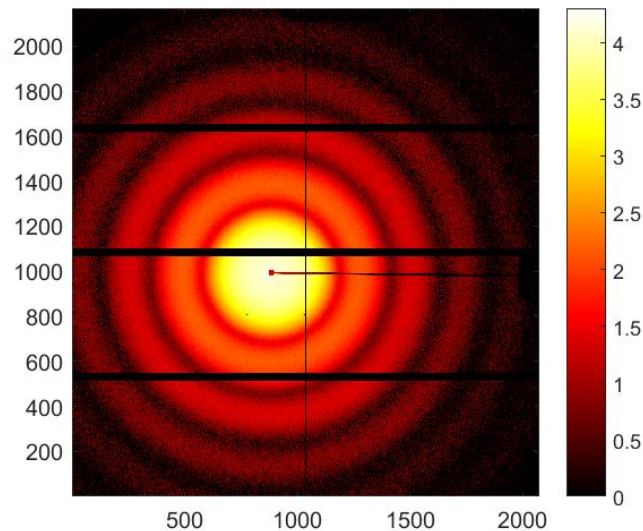


Figure 1: Scattering pattern of a nanoparticle suspension with a mean particle radius of 100 nm as detected by an Eiger X4M detector with a $155 \times 162 \text{ mm}^2$ sensitive area.