

Poster Presentation

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Serial Femtosecond Crystallography user's consortium apparatus at European XFEL

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The Serial Femtosecond Crystallography (SFX) user's consortium apparatus is to be installed within the Single Particles, Clusters and Biomolecules (SPB) instrument of the European X-ray Free-Electron Laser facility (XFEL.EU) [1, 2]. The XFEL.EU will provide ultra-short, highly intense, coherent X-ray pulses at an unprecedented repetition rate. The experimental setup and methodological approaches of many scientific areas will be transformed, including structural biology that could potentially overcome common problems and bottlenecks encountered in crystallography, such as creating large crystals, dealing with radiation damage, or understanding sub-picosecond time-resolved phenomena. The key concept of the SFX method is based on the kinetic insertion of protein crystal samples in solution via a gas dynamic virtual nozzle jet and recording diffraction signals of individual, randomly oriented crystals passing through the XFEL beam, as first demonstrated by Chapman et al. [3]. The SFX-apparatus will refocus the beam spent by the SPB instrument into a second interaction region, in some cases enabling two parallel experiments. The planned photon energy range at the SPB instrument is from 3 to 16 keV. The Adaptive Gain Integrating Pixel Detector (AGIPD) is to be implemented in the SPB instrument, including a 4 Megapixel version for the SFX-apparatus. The AGIPD is designed to store over 350 data frames from successive pulses, and aims to collect more than 3,000 images per second. Together with the implementation of automated procedures for sample exchange and injection, high-throughput nanocrystallography experiments can be integrated at the SFX-apparatus. In this work, we review the overall design of the SFX-apparatus and discuss the main parameters and challenges

[1] M. Altarelli et al., *Tech. Rep., DESY, Hamburg, Germany (2007)* http://xfel.desy.de/technical_information/tdr/tdr/, [2] A.P. Mancuso et al., *Tech. Des. Rep., European XFEL, Hamburg, Germany (2013)*, XFEL.EU TR-2013-004, doi:10.3204/XFEL.EU/TR-2013-004, [3] H.N. Chapman et al., *Nature*, 470, 73 (2011)

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