

# **The Single Particles, Clusters and Biomolecules and Serial Femtosecond Crystallography (SPB/SFX) Instrument at European XFEL**

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## **Abstract**

X-ray free-electron lasers (XFELs) deliver highly brilliant x-ray pulses, enabling to measure bright diffraction signals for higher spatial resolutions correspondingly. In addition, the European XFEL is the first high repetition rate hard x-ray FEL having 27000 x-ray pulses per second (2700 pulses per 0.6 ms pulse-train and 10 trains per second) with 4.5 MHz repetition rate. With a combination of both a pulsed x-ray and a pulsed optical laser system, it is possible to measure the structural changes of specimens at different time gaps in between x-ray and laser pulses. With a high repetition rate facility, it is possible to acquire much more data in a short period of time; which is especially helpful for not only experiments having challenges due to low hit rates but also for so-called pump-probe experiments which need many time steps to follow the dynamics of a given system.

The SPB/SFX instrument started the first user operation among the six end-stations of European XFEL in September 2017. Ultimate aims of SPB/SFX are to unveil the structures of both crystalline and non-crystalline biomolecules/clusters. In this presentation, I will introduce the specifications and scope of the SPB/SFX instrument [1, 2] including properties of upstream and downstream interaction regions in the experiment hutch as well as describing the sample delivery systems, 2D detectors, supporting optical laser system, key diagnostic components, and more required to achieve the goal of structure determination at XFELs. In addition, early user results at SPB/SFX will be introduced [3, 4].

## **References**

- [ 1 ] A. P. Mancuso, et al., Journal of Synchrotron Radiation 26 660-676 (2019)
- [ 2 ] H. Kirkwood, et al., Opt. Letters 44(7) 1650 (2019)
- [ 3 ] M. O. Wiedorn, et al., Nature Communications 9(1), 4025 (2018)
- [ 4 ] M. L. Grünbein, et al., Nature Communications 9(1), 3487 (2018)

## **Biography**

Yoonhee Kim studied Life Science at Hanyang University for her undergraduate study, then moved to Gwangju Institute of Science and Technology for graduate studies. She majored Coherent X-ray Diffractive Imaging, and also performed various kinds of x-ray based imaging studies in there. After that, she moved to European XFEL in Germany and works as an instrument scientist and postdoc.