

## GI-MS46-02 | MEGAHERTZ RATE SERIAL CRYSTALLOGRAPHY AT THE EUROPEAN XFEL

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Serial Femtosecond Crystallography (SFX) [1] is relatively novel variant of crystallography developed for X-ray Free Electron Lasers which is exceptionally useful for radiation damage sensitive samples, irreversible time-resolved systems and more [2]. Since its inception, SFX has also been realized at high brightness synchrotron sources [3].

The European X-ray Free Electron Laser (EuXFEL) is the only operating high repetition rate XFEL in the world [4]. It can produce up to 27000 pulses of highly intense, hard X-ray wavelength pulses of tens of femtoseconds duration every second. High repetition rate XFELs offer an unprecedented ability to generate large quantities of serial crystallography data. Specifically, this is particularly useful for time-resolved studies where a given quantity of data frames need to be collected for each time point investigated.

This presentation will give an overview of the capabilities of the SPB/SFX instrument at the EuXFEL [5], as well as show some of the science performed to date including megahertz repetition rate serial crystallography [6,7] as well as time-resolved work. An outlook to future capabilities will also be shown.

- [1] Chapman *et al.*, *Nature* **470**, 73–77 (2011).
- [2] Spence, *IUCrJ* **4**, 322–339 (2017).
- [3] Gati *et al.*, *IUCrJ* **1**, 87–94 (2014).
- [4] Tschentscher *et al.*, *Appl. Sci.* **7**, 592 (2017).
- [5] Mancuso *et al.*, *J. Synchrotron Radiat.* **26**, 660–676 (2019).
- [6] Grünbein *et al.*, *Nat. Commun.* **9**, 3487 (2018).
- [7] Wiedorn *et al.*, *Nat. Commun.* **9**, 4025 (2018).