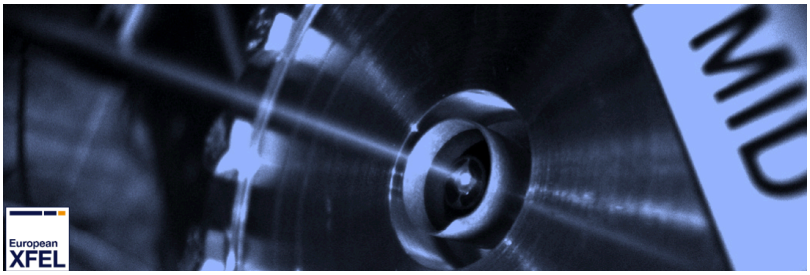


Contribution ID: **40** Type: **Talk**

# Enhancing capabilities of XFEL scattering techniques by short-wavelength radiation

*Thursday 19 January 2023 16:35 (20 minutes)*

This talk reviews current limitations of XFEL scattering techniques and discusses potential impact of the very hard XFEL pulses on the structure determination, while presenting relevant experimental data taken at SACLA.

The first half of this talk reviews the XFEL-induced damage (sample heating [1,2] and ultrafast electron excitations [3,4]), which is inevitable when using focused X-ray pulses produced by current XFEL machines. The short-wavelength radiation relaxes such radiation damage and thereby enhances the capabilities of existing XFEL scattering techniques, such as ultrafast X-ray photon correlation spectroscopy [2] and high-resolution serial femtosecond crystallography [5].

In the remaining part of the talk, I would propose a few tricky experiments using very hard XFEL pulses, including structure determination of materials under high magnetic fields (more than 100 T) [6] and nonlinear diffraction techniques [7] for material characterization and a basis for X-ray pulse shaping and compression.

[1] F. Lehmkühler et al., PNAS 117, 24110 (2020).
[2] Y. Shinohara et al., Nature Commun. 11, 6213 (2020).
[3] N. Medvedev and B. Ziaja, Sci. Rep. 8, 5284 (2018).
[4] I. Inoue et al., Phys. Rev. Lett. 126, 117403 (2021).
[5] K. Takaba et al., accepted to Nature Chem. (ChemRxiv 10.26432/chemxiv-2021-jvbfl).
[6] A. Ikeda et al., Appl. Phys. Lett. 120, 142403 (2022).
[7] I. Inoue, B. Ziaja et al., in preparation.

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