



Contribution ID : 7

Type : Oral

Wavefield Characterisation of MHz XFEL Pulse Trains

Thursday, 25 November 2021 13:50 (15)

X-ray Free Electron Laser (XFEL) light sources present new opportunities in the imaging of single particles and biomolecules. The interpretation and analysis of XFEL imaging data depends critically on a fundamental understanding of the characteristics of the inherently stochastic XFEL pulses delivered to the instrument. Exploiting the unique MHz repetition rate of the European XFEL to image single particles requires an improved understanding of both the inter- and intra-train fluctuations in pulse structure and beam pointing, which are frequently implicated in the loss of information in XFEL single particle imaging (SPI) and other classes of coherent diffraction experiment. Failure to account for fluctuations of the electron bunch phase-space and/or trajectory within a pulse train can result in deviations of the recorded wavefront and intensity statistics from theoretical behaviour and lead to conflation of the structure of the source and sample in single particle reconstruction.

Contrary to expectations, X-ray optical data collected at the SPB-SFX instrument of the European XFEL demonstrates a sensitivity of inter- and intra-train variations in beam pointing to beam delivery parameters, including the order of a pulse within a train. This data is presented in comparison to a partially coherent wave optical simulation of the SPB-SFX instrument, through which photon diagnostics have been designed and developed, with the goal of improving the stability and subsequent imaging quality of the user-end photon beam. We describe these preliminary results within the scope of developing a novel phase-retrieval method applicable to the study of MHz repetition rate XFEL sources, using nearfield speckle-tracking measurements.

Level of Expertise

Student

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

None of the above

Students Only - Are you interested in AINSE student funding

Yes

Do you wish to take part in the Student Poster Slam

No

Condition of submission

Yes

Primary author(s) : Mr GUEST, Trey (La Trobe University, European XFEL)

Co-author(s) : PAGANIN, David (School of Physics and Astronomy, Monash University); VAN RIESSEN, Grant (La Trobe University); Prof. ABBEY, Brian (La Trobe University); Dr BEAN, Richard (European XFEL); Dr MANCUSO, Adrian (European XFEL)

Presenter(s) : Mr GUEST, Trey (La Trobe University, European XFEL)

Session Classification : Physics, Surface & Condensed Matter

Track Classification : Physics, Surface & Condensed Matter