Contribution ID: **60** Type: **Invited talk**

Energy spread increase by intrabeam scattering and microbunching in FEL injectors

Thursday, June 22, 2023 3:00 PM (25 minutes)

The energy spread is one of the properties that determine the brightness of electron beams and a fundamental parameter in X-ray free-electron lasers (FELs). In the last couple of years, measurements at different FEL injectors have shown energy spread values much larger than predicted by simulations. This talk will present high-resolution energy spread measurements at the SwissFEL injector as a function of the electron peak current, the optics, and the longitudinal dispersion of the lattice. The measured dependences indicate that the energy spread increase is caused by intrabeam scattering and microbunching instability, effects not covered in the conventional modeling of FEL injectors. We will also show numerical calculations that reproduce the experimental data and a recipe to mitigate the energy spread deterioration. The work underlines the importance of considering the energy spread in the optimization and design of high-brightness electron beam sources and the need to develop new models to adequately understand and simulate the observed physics effects.

Primary author: PRAT, Eduard (Paul Scherrer Institut)

Presenter: PRAT, Eduard (Paul Scherrer Institut)

Session Classification: Beam dynamics and controls