7th European Advanced Accelerator Conference

EAAC2025

Contribution ID: **660** Type: **Poster (participant)**

Less is more: unconventional Compton source optimisation for soft- and hard x-rays

Wednesday, 24 September 2025 19:00 (1h 30m)

In inverse Compton scattering (ICS), tunable and narrowband x-rays are produced by collisions between relativistic electron bunches and intense laser pulses. In conventional Compton source designs, the x-ray photon energy is tuned by varying the electron energy, which has the drawback of reduced brilliance at soft x-ray energies. Additionally, to achieve sufficient x-ray flux, high bunch charges are utilized, which lead to reduced coherence and high background radiation. In this presentation we discuss two ideas which run counter to the conventional approaches while resulting in a significantly improved performance, in particular at soft x-ray energies. First, by decreasing the electron emission area in the photogun, the electron bunch charge can be decreased without loss of x-ray flux, while gaining x-ray coherence. Second, by changing the laser interaction angle, rather than the electron energy, the x-ray energy can be varied by several orders of magnitude, whilst maintaining the favourable properties of the high energy electrons. This makes Compton scattering a viable source for soft x-rays. We provide an analytical framework to analyse these concepts and investigate their limits. We propose a photocathode-based ICS beamline providing high-brilliance x-rays, continuously tunable from soft to hard photon energies.

Primary authors: SWEERS, Coen (Eindhoven University of Technology); LUITEN, Jom

Presenter: SWEERS, Coen (Eindhoven University of Technology)

Session Classification: Poster Session

Track Classification: PS5: Applications