

# Generation of coherent pulses via multiple-echo-enabled harmonic generation in storage rings

Wednesday 3 September 2025 16:50 (20 minutes)

In comparison to free electron lasers, storage ring light sources (SRLS) can reuse a single electron beam to serve multiple users, offering high repetition rates and cost efficiency. However, despite the transverse emittance reaching the X-ray diffraction limit in fourth-generation SRLS, the storage ring suffers from limited longitudinal coherence. Enhancing longitudinal coherence has been shown to significantly improve spectral brightness, time resolution, and energy resolution. Laser modulation schemes for SRLS have been explored for their potential to induce strong micro-bunching, thereby enhancing spectral power and coherence. However, these methods modulate each bunch only once per revolution, limiting their application to a single beamline and underutilizing the multi-user capacity of storage rings. To enable coherent radiation delivery to multiple beamlines, we propose a multiple-echo-enabled harmonic generation scheme. This approach modulates the electron beam multiple times, generating coherent pulses at different wavelengths. By leveraging the multi-user capability of storage rings while simultaneously improving longitudinal coherence, our method enhances both spectral and temporal performance.

## Footnotes

## Funding Agency

## I have read and accept the Privacy Policy Statement

Yes

**Author:** LIU, Weihang (Institute of High Energy Physics)

**Co-authors:** ZHAO, Yu (Institute of High Energy Physics); QIN, Weilun (Deutsches Elektronen-Synchrotron DESY)

**Presenter:** LIU, Weihang (Institute of High Energy Physics)

**Session Classification:** Parallel Talk Session 1

**Track Classification:** MC6: Photon Sources and Electron Accelerators