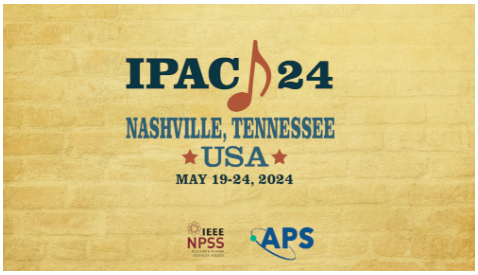

Contribution ID: **1504** Contribution code: **MOPS42** Type: **Poster Presentation**

Start-to-end simulations of microbunching instability based on optimized velocity bunching in linac-driven FELs

Monday, 20 May 2024 16:00 (2 hours)

The microbunching instability (MBI) driven by beam collective effects can cause significant electron beam quality degradation in advanced X-ray free electron lasers. Typically, multiple stage magnetic bunch compressors used to generate high peak current electron beam will dramatically amplify the microbunching instability. In this paper, by redesigning the solenoid elaborately and adopting a dual-mode buncher cavity with the third harmonic mode used to correct the RF curvature, in combination with the evolutionary many-objective beam dynamics optimization, it is potential for the electron beam to be further compressed in velocity bunching (VB) process. Therefore, a VB plus one bunch compressor could be a promising alternative scheme to achieve moderate peak current beam for X-ray FELs. Start-to-end simulations based on the Shanghai high-repetition-rate XFEL and extreme light facility proves the feasibility of the scheme in suppressing the additional MBI gain due to multi-stage magnetic bunch compressors.

Footnotes

Funding Agency

Paper preparation format

LaTeX

Region represented

Asia

Primary author: CHENG, Wencai (Shanghai Institute of Applied Physics)

Co-authors: ZHU, Zihan (SLAC National Accelerator Laboratory); ZHAO, Minghua (Shanghai Institute of Applied Physics); ZHANG, Meng (Shanghai Advanced Research Institute); GU, Duan (Shanghai Advanced Research Institute)

Presenter: ZHU, Zihan (SLAC National Accelerator Laboratory)

Session Classification: Monday Poster Session

Track Classification: MC5: Beam Dynamics and EM Fields: MC5.D05 Coherent and Incoherent Instabilities Theory, Simulations, Code Development