



Contribution ID: 101 Contribution code: TUP101-MOB

Type: Poster Presentation

Impact of local bunching factor on the performance of THz FEL

Tuesday 20 August 2024 17:20 (20 minutes)

Experimental studies on THz FELs at the Photo Injector Test facility at DESY in Zeuthen (PITZ) have revealed that the THz radiation pulse energy is significantly higher than predictions by Genesis1.3 simulation using the standard shot noise model. To understand the underlying mechanism, the bunching factors of individual slices with a length of the resonant wavelength (local bunching factors), have been calculated considering the actual current profile within each slice. It is found that the current profile contributes to the bunching factors several orders of magnitude higher than that from the shot noise of a uniform current profile within each slice. This effect is pronounced near the half-maximum of the beam current profile, where the current gradient is particularly strong, while the current value remains significant. Meanwhile, the bunching phase along the slice also becomes stable other than randomly distributed. The current profiles of electron beams from start-to-end simulations have been used to introduce a local bunching factor for each slice in the Genesis1.3 simulations, and the results will be presented in this paper.

Footnotes

Funding Agency

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Session Classification: Poster session

Track Classification: FEL theory