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Emittance Optimization studies with Photo-Injector Laser Pulse shaping for PITZ

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The Photo Injector Test Facility at DESY in Zeuthen (PITZ) develops and optimizes high-brightness electron sources for modern Free Electron Lasers (FELs), like the European XFEL. PITZ's goal is to generate intense electron beams having small transverse emittance to achieve optimum FEL performance. ASTRA simulations have been used as a tool to study the optimal parameters at PITZ for the minimization of emittance and will be presented. The longitudinal pulse shaping of Photo Injector's photocathode laser can effectively reduce emittance growth due to space charge effects. A benchmarking analysis of Gaussian and Flattop laser profiles will be presented. The lasing process in XFEL occurs predominantly through highly charged slices with low emittance, assumed to originate from the longitudinal core of the electron bunch in the photo injector. The optimization of transverse emittance of these segments along with projected emittance are carried out through ASTRA. The results of these comprehensive optimization studies will be presented in terms of further improving the performance of European XFEL.

Summary

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