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First simulations for the EuAPS betatron radiation source

X-rays production through betatron radiation emission from electron bunches is a valuable resource for various research fields. The EuAPS (EuPRAXIA Advanced Photon Sources) project, within the framework of the EuPRAXIA project, aims to provide 1-10 keV photons (soft X-rays) using a compact plasma-based system designed to exploit self-injection processes that occur in laser-plasma interaction (LWFA) to drive electron betatron oscillations. Since the emitted radiation spectrum, intensity, angular divergence, and possible coherence strongly depend on the properties of the self-injected beam, accurate preliminary simulations of the process are necessary to evaluate the optimal diagnostic device specifications. Electron trajectories from particle-in-cell (PIC) simulations are currently undergoing numerical analysis through the calculation of retarded fields and spectra for various plasma and laser parameter combinations. At the same time, an analytical approach is being examined to obtain an expression for the emitted spectrum, assuming linear or quadratic electron energy variation.

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