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The physical design for High-Repetition-Rate IR-THz FEL

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The field of Free-Electron Lasers (FELs) has matured, with advancements prioritizing high repetition rates, full coherence, and an expanded wavelength spectrum. This paper details the establishment of a high-repetition-rate Infrared Terahertz (IR-THz) Free-Electron Laser (FEL) facility at the Hefei Comprehensive National Science Center. This facility is strategically integrated with the existing HALF light source, forming a cohesive low-energy synchrotron radiation and FEL facility cluster that amplifies research capabilities. We present an innovative approach to optimizing microwave parameters within the linear acceleration section, employing a custom MATLAB program developed in-house. This method enables meticulous control over the beam current profile, ensuring the generation of high-quality beams tailored for FEL applications. Through the utilization of advanced software such as ASTRA and CSRTrack, we have executed comprehensive beam dynamics simulations and calculations, successfully achieving beam quality that aligns with the stringent requirements of FEL applications.

Footnotes

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