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Ultrafast free-electron laser generation with optical beat note

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As one of the most important frontiers of international science and technology, the development of ultrafast science has provided important research tools for many disciplines. Free-electron laser (FEL) has the unique advantages of high power and short wavelength in generating ultrafast pulses. In this paper, the theoretical simulations were performed to produce the ultrafast pulses, utilizing an electron beam compressed by an optical beat note. The main parameters used in the simulation are from Shanghai Soft X-ray Free Electron Laser Facility (SXFEL). The results show that an isolated FEL pulse with the peak power of 700 MW and the pulse duration of ~ 1 femtoseconds can be generated. In addition, we discuss the effect of the relative delay jitter of optical beating laser on ultrafast radiation. The result shows that the scheme is very sensitive to time delay jitter.

Footnotes

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