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Carrier-envelope phase stabilization in FEL oscillators

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FEL oscillators can produce few-cycle optical pulses with a high-extraction efficiency when the oscillators are operated in the superradiant regime. *Such FEL oscillators are unique light sources to explore intense light field science, especially in mid-infrared and longwave infrared where ultrashort pulses are difficult to produce from conventional lasers. Since the laser-matter interaction in the intense field regime is described in terms of the oscillating electric field rather than the instantaneous intensity, the carrier-envelope phase (CEP) must be stabilized in many applications of few-cycle optical pulses to the intense light field science. Stabilization of CEP in FEL oscillators has been proposed with an external seed laser and coherent radiation of electron bunches **.* In this paper, we study CEP stabilization in FEL oscillators with numerical simulations and discuss applications of CEP-stable FEL pulses in the intense light field science.

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Footnotes

- R. Hajima and R. Nagai, Phys. Rev. Lett. 119, 204802 (2017). ** P. Pongchalee and B. McNeil, FEL-2022. MOP32 (2022).

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Primary author: HAJIMA, Ryoichi (National Institutes for Quantum Science and Technology)

Co-authors: ZEN, Heishun (Kyoto University); KAWASE, Keigo (National Institutes for Quantum Science and Technology); OHGAKI, Hideaki (Kyoto University)

Presenter: HAJIMA, Ryoichi (National Institutes for Quantum Science and Technology)

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