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High-gain free-electron laser with orbital angular momentum seeded by an x-ray regenerative amplifier

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Cavity-based FELs, including x-ray free electron laser oscillators (XFEL) and x-ray regenerative amplifiers (RAFEL), have been proposed to generate fully coherent x-rays at high repetition rates. Among them, the oscillator-amplifier scheme can be used to generate high-brightness x-ray beams. Motivated by this technique, we propose a promising scheme to generate a fully coherent x-ray seed laser for the HGHMG system. In this scheme, an x-ray regenerative amplifier is used to offer a fully coherent x-ray seed laser to modulate the electron beam in a helical undulator. With an energy-chirped electron beam, one part electron beam will not lase in the regenerative amplifier since the FELs resonance relationship is not satisfied. This part of the electron beam will be helically modulated in a helical undulator by the coherent x-ray from the previous regenerative amplifier. With the proposed technique, high power and high repetition rate x-ray with OAM can be produced, which will open routes to scientific research in x-ray science.

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Footnotes

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Yes

Primary author: SUN, Hao (Shanghai Institute of Applied Physics)

Co-authors: LIU, Bo (Shanghai Advanced Research Institute); FENG, Chao (Shanghai Advanced Research Institute)

Presenter: SUN, Hao (Shanghai Institute of Applied Physics)

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