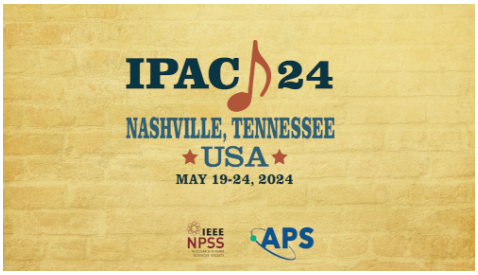

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Generating tunable X-ray optical frequency combs using a free-electron laser

Sunday, 19 May 2024 16:00 (2 hours)

As an important experimental tool, the Optical Frequency Combs (OFCs) has had a profound impact on research in various fields, whereas, generating high power high repetition frequency OFCs at tunable frequencies is still a limitation for most of the existing methods. In this study, free-electron laser (FEL) is proposed to generate coherent X-ray OFC with a tunable repetition frequency and high pulse energy. The approach involves using a proper seed laser with frequency modulation, followed by amplification in the Echo-Enabled Harmonic Generation (EEHG) mode to generate X-ray OFCs. Numerical simulations using the realistic beam parameters of the Shanghai soft X-ray free-electron laser facility have demonstrated the feasibility of generating X-ray OFCs. These OFCs have a peak power of about 1.5 GW and repetition frequencies ranging from 6 THz to 12 THz at Centre energies carbon K edge (˜284 eV). The proposed technique presents new possibilities for resonant inelastic x-ray scattering (RIXS) spectroscopy and Terabit-level coherent optical communication, etc.

Footnotes

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