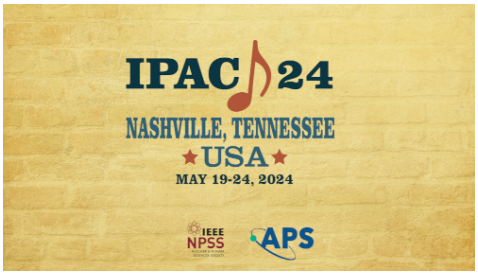

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Compton gamma-ray production enabled by VUV FEL operating around 170 nm

Monday, 20 May 2024 16:00 (2 hours)

The linac-based single-pass FEL has been successfully operated
in the EUV and x-ray regions for about two decades. However, the oscillator FEL has been limited to operating in the longer wavelength region. This limitation arises from the challenge of obtaining short-wavelength FEL mirrors with high reflectivity, thermal stability, and radiation resistance. With the Duke storage ring FEL, we have demonstrated VUV FEL lasing from 168.6 to 179.7 nm with excellent beam stability. This progress has been made possible by developing a new FEL configuration with substantially reduced undulator harmonic radiation on the FEL mirror, a thermally stable FEL optical cavity, and a new type of high-reflectivity fluoride-based multilayer coating with a protective capping layer. Employing this VUV FEL in Compton scattering, we have also produced a high-flux, circularly polarized gamma-ray beam up to 120 MeV at the High-Intensity Gamma-ray Source (HIGS). The high-energy gamma rays will open up new opportunities for experimental study of the nucleon's structure through the lens of Chiral Perturbation Theory.

Footnotes

- Y.K. Wu et al., J. Appl. Phys. 130, 183101 (2021); doi: 10.1063/5.0064942

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