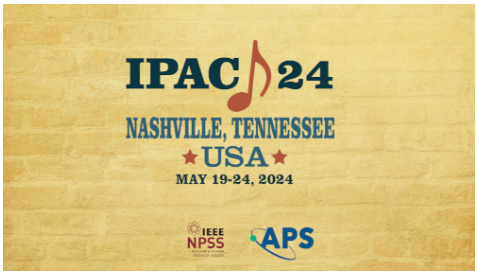

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High-energy and narrow-bandwidth X-ray regenerative amplifier FEL design for LCLS-II-HE

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

LCLS-II-HE is an energy upgrade of the LCLS-II linac from 4 GeV to 8 GeV. The X-ray FEL photon energy (Self-Amplified Spontaneous Emission mode) will extend towards 12 keV (from the present 5 keV) based on the current beam emittance. To reach higher photon energy range towards 20 keV, a new injector with a much brighter electron beam will be required. Here we study an X-ray regenerative amplifier FEL (XRAFEL) configuration that enables reaching 20 keV photon energy with the current LCLS-II injector parameters, by reamplifying the cavity-returned X-rays in the LCLS-II undulator over multiple passes. At 20 keV, the Bragg mirrors have very narrow angular and wavelength acceptances. In this paper, we discuss how to layout the cavity optics in combination with the electron-beam based Q-switching method to generate fully coherent bright high-energy X-rays with 20 meV spectral bandwidth.

Footnotes

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