



Contribution ID: 951 Contribution code: TUPL079

Type: **Poster Presentation**

Enhanced harmonic generation for high-repetition-rate soft X-ray free-electron laser

Tuesday, 9 May 2023 16:30 (2 hours)

Externally seeded free-electron lasers are promising for generating intense, stable, and fully coherent soft X-ray pulses. An earlier study demonstrates that high brightness and coherent soft X-ray radiation can be produced based on coherent harmonic generation and superradiant principles, termed high-brightness high-gain harmonic generation (HB-HGHG). However, due to the limitations of state-of-the-art laser systems, seed lasers in the ultraviolet region cannot induce sufficient energy modulation at high repetition rates. A recently suggested self-modulation scheme shows that the peak power requirement of a seed laser can be reduced by around one order of magnitude in an HGHG setup. In this paper, we present start-to-end simulation results to estimate the feasibility of the self-modulation-enhanced HB-HGHG scheme.

Funding Agency

Footnotes

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Session Classification: Tuesday Poster Session

Track Classification: MC2: Photon Sources and Electron Accelerators: MC2.A06: Free Electron Lasers