FEL2024

Contribution ID: **247** Contribution code: **TUP247-TUA**   Type: **Poster Presentation**

Temporal and spatial coherence properties of the odd harmonics of the radiation from X-ray free electron laser with planar undulator

Tuesday 20 August 2024 20:40 (20 minutes)

Radiation from SASE FEL with planar undulator contains visible contribution of the odd harmonics. Comprehensive studies of the nonlinear harmonic generation mechanism have been performed in * in the framework of the one-dimensional model. General features of harmonic radiation have been determined. It was found that coherence time at saturation falls inversely proportional to harmonic number, and relative spectrum bandwidth remains constant with harmonic number. In this paper we extend studies of higher harmonics taking into account diffraction effects. We consider parameter range when intensity of higher harmonics is mainly defined by nonlinear harmonics generation mechanism. Temporal and space correlation functions, coherence time and degree of transverse coherence are calculated using results of numerical simulations with the code FAST. Simulation of the FEL process has been performed using actual number of electrons in the beam. Application of similarity techniques allowed us to derive universal dependencies for the main characteristics of the SASE FEL covering all practical range of optimized X-ray FELs**. Present studies cover results for the 1st, 3rd, and 5th harmonic.

Footnotes

- E.L. Saldin, E.A. Schneidmiller and M.V. Yurkov, Properties of the third harmonic of the radiation from self-amplified spontaneous emission free electron laser, Phys. Rev. ST Accel. Beams 9(2006)030702. ** E.L. Saldin, E.A. Schneidmiller and M.V. Yurkov, Coherence properties of the radiation from X-ray free electron laser, Optics Communications, 281(2008)1179-1188.

Funding Agency

Author: Dr YURKOV, Mikhail (Deutsches Elektronen-Synchrotron)

Presenter: Dr YURKOV, Mikhail (Deutsches Elektronen-Synchrotron)

Session Classification: Poster session

Track Classification: SASE-FEL