THE HARMONIC CASCADED FEL

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Abstract

Free Electron Laser (FEL) devices based on sequence of amplifiers with an harmonic relation between the resonant frequencies of each section, have been proposed to extend to shorter wavelengths the FEL operating range. When this cascade of undulators is operated at intensities above saturation, a short optical pulse propagates in superradiant regime, and the pulse is upl-lconverted in frequency according the resonance central frequency of each undulator segment. In this paper we study the case where the undulators of the cascade are not resonant at the fundamental frequency but have one of the higher order harmonics at a common frequency. In these conditions high harmonic multiplication factors in the final stage may be obtained with a relatively low energy electron beam. The numerical analysis required to introduce higher order harmonic lasing in GENESIS 1.3, a brief description of the modifications to the code and of the benchmarking is also given.

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