COHERENCE PROPERTIES OF THE RADIATION FROM X-RAY FELS

E. Schneidmiller, M.V. Yurkov, DESY, Hamburg, Germany

Abstract

Start-up of the amplification process in x-ray FELs from the shot noise in the electron beam defines a specific behavior of longitudinal and transverse coherence properties of the radiation. Particularly important is the case of an x-ray FEL optimized for maximum gain of the fundamental radiation mode. Applying similarity techniques to the results of numerical simulations allowed us to find universal scaling relations for the main characteristics of an optimized X-ray FEL operating in the saturation regime: efficiency, coherence time and degree of transverse coherence. We find that with an appropriate normalization of these quantities, they are functions of only the ratio of the geometrical emittance of the electron beam to the radiation wavelength. Statistical and coherence properties of the higher harmonics of the radiation are highlighted as well.

CONTRIBUTION NOT RECEIVED