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Coherent Radiation Characteristics of Modulated Positron Bunch, Formed in Crystalline Undulator

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The coherent X-ray radiation at a zero angle and at a resonant frequency, formed in crystalline undulator (CU) by the modulated positron bunch, is investigated. Taking into account the medium polarization, CU parameter and bunch energy are determined for both the conservation of channeling phenomenon and the photon beam with optimal characteristics. The spectrum of a coherent radiation has Gaussian distribution around a resonant frequency, unlike the spectrum of a spontaneous radiation, having the form of diffraction sine. Besides that the radiation intensity increases and the spectrum is narrowed. These changes are essential, if the modulation depth is not too small. Experiment is suggested, the results of which can determine this important parameter of modulation too. The case, when a positron bunch with LCLS parameters is modulated in the process SASE FEL, is considered.

Autore principale: Sig. GEVORGYAN, Hayk (Student)

Coautore: Prof. LEKDAR GEVORGIAN, Lekdar (A. I. Alikhanian National Science Laboratory (Yerevan Physics Institute))

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