THREE FREQUENCY UNDULATOR RADIATION FEL GAIN OF BETATRON OSCILLATIONS AND BEAM ENERGY SPREAD

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Abstract

A new three frequency undulator has been proposed[1].The authors assume that the electron moves on axis in a three harmonic undulator structure. Let us consider the case of the fundamental. The intensity at this frequency will be further enhanced by the contribution from the modulation at sum-difference frequencies . For the next odd harmonics of the fundamental, there will be contributions from the harmonic field components to produce an enhanced intensity at the third odd harmonics. At this frequency there will be further contributions from the sum-frequency. However the intensity contributions from the sum-difference frequency will be small in comparison to the primary odd harmonics and the net result is that the third harmonic intensity will be raised . Thus the three frequency works in a similar way to that of the harmonic undulator scheme. In this paper we calculate the three frequency undulator radiation and discuss the feasibility of free electron laser operation with this undulator scheme and also special attention to enhance gain in the presence of the betatron oscillations in the system.
1. V. I.R. Niculescu etal. Rom Journ. Phy. Vol.53,,Nos.5-6,,P.775-780,2008

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