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Matched electron beams in multi stage laser wakefield acceleration.

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A perspective scheme of accelerators suitable for high energy physics experiments is a multi stage laser wakefield acceleration. Relativistic electron bunch accelerated in the laser wakefields undergoes betatron oscillations and emits synchrotron radiation that affects the dynamics of electron motion and polarization. A model for numerical simulation of the acceleration of polarized electrons has been developed in Ref. [1]. In this work, to describe the synchrotron radiation of particles the radiative reaction force in the Landau-Lifshitz form was used and quantum recoil effects were taken into account. In simulations, an electron bunch was accelerated in preformed plasma channel with the initial emittance matched to the averaged focusing forces. To preserve the beam emittance during transport between stages, the adiabatically decreasing plasma density and an increasing channel radius were used at the exit of accelerating stages [2]. The evolution of beam emittance during acceleration is studied and the final depolarization of accelerated electrons is estimated.

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[1] D.V. Pugacheva, N.E. Andreev, *Quantum Electronics* 46 (2016) 88

[2] P. Tomassini, A. R. Rossi, *Plasma Phys. Control. Fusion* 58 (2016) 034001

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