

# Multi-stage laser-plasma acceleration of ultrashort bunches of electrons and positrons

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The project of multi-stage electron accelerator based on a multi-channel laser installation with a laser pulse power up to 25 PW in one channel is proposed. In contrast to the strong non-linear acceleration regimes with the presence of electron density cavitation on the radiation propagation axis, the proposed moderately non-linear regime will allow to achieve not only sufficiently high energies (60–100 GeV on 3–5 stages of the accelerator), but also high quality of accelerated electron bunches (relative energy spread not higher than 1%, normalized emittance not higher than 1 mm×mrad) [1].

That is important for numerous applications, such as implementation of precision tests of the Standard Model, experiments in quantum electrodynamics (generation of electron-positron pairs), experiments on creating powerful sources of short-wavelength (gamma rays) radiation. Implementation of the project will allow to come close to these researches important for the development of theory and modern practical applications. The preliminary analytical analysis and numerical simulations confirm the achievability of the above parameters of electron bunches in the case of the implementation of the proposed project.

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