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Compression and acceleration of high-energy electron beam by intense short pulse laser[1] SHIGEO KAWATA, Graduate School of Eng., Utsunomiya Univ., Japan, SHUJI MIYAZAKI, KEI SAKAI, SHOTARO HASUMI, RYO SONOBE, QING KONG, Inst. Modern Physics, Fudan Univ., TAKASHI KIKUCHI, Graduate School of Eng., Utsunomiya University — A generation of a high-density electron bunch is investigated. In order to compress a pre-accelerated electron bunch, we employ a laser of a TEM_{10} mode + TEM_{01} mode. This laser has a circle-shaped intensity distribution in transverse, and the pre-accelerated electrons are confined by the transverse ponderomotive force in transverse. A laser longitudinal electric field accelerates the pre-accelerated electrons further in longitudinal[1]. At the parameter values of a_0=10, λ=0.8 μm, w_0=20λ, L_z=10λ, and γ_i=7, the maximum electron energy is about 400 MeV. Here a_0 is the dimensionless value of the laser amplitude, λ is the laser wavelength, w_0 is the laser spot size, L_z is the pulse length and γ_i is the relativistic factor of the pre-accelerated electrons. The electrons accelerated are compressed into a length of about 10λ from the original size of 150λ. Our analytical study also shows that if the laser intensity and pre-accelerated electrons are in relativistic, the electron energy is proportional to a_0. This scaling law agrees well with the simulation results. [1] S. Miyazaki, S. Kawata, Q. Kong, et al., J. Phys. D: Appl. Phys. 38, pp. 1665-1673 (2005).

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