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Attosecond electron beam controllably generated from plasma layer by superintense ultrashort laser pulse VICTOR KULAGIN, MIN SUP HUR, HYYONG SUK, CAA KERI, Changwon,Korea, VLADIMIR CHEREPENIN, IRE RAS, Moscow, Russia — For controllable generation of ultrashort electron beams, we propose to use a thin plasma layer (with or without compensating positive charge) irradiated normally by a super-high intensity ultrashort laser pulse [1,2]. The electrons of the plasma layer are accelerated during laser pulse action longitudinally to relativistic velocities by the nonlinear component of the Lorentz force, provided a dimensionless field amplitude is large enough. We show analytically and by 2D PIC simulations that it is possible to choose the parameters of the laser pulse and the plasma layer in such a way that only *a single short and ultracold relativistic electron beam* will be produced (and can survive for some time) rather than a cloud of chaotically moving electrons. To realize this, the transparency of the plasma layer has to be large enough, the amplitude of the laser pulse has to be relativistic, and the laser pulse has to have a sharp rising edge. These ensure that the bunch will be greatly compressed in longitudinal direction at the initial stage of interaction with the front of the laser pulse. The theory for this process is elaborated, and results are compared with 1D PIC simulations. [1]. V. V. Kulagin, V. A. Cherepenin and H. Suk, Appl. Phys. Lett., **85**, 3322 (2004). [2]. V. V. Kulagin, V. A. Cherepenin and H. Suk, Phys. Plasmas, **11**, 5239 (2004).

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