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Ionization-assisted Relativistic Electron Generation with Monoenergetic Features from Laser Thin Foil Interaction ARTEM KARPEEV, IGOR GLAZYRIN, OLGA KOTOVA, Russian Federal Nuclear Center - E.I.Zababakhin Institute of Technical Physics, Russia, VALERY BYCHENKOV, P. N. Lebedev Physics Institute RAS, Russia, ROBERT FEDOSEJEVS, Department of Electrical and Computer Engineering, Canada, WOJCIECH ROZMUS, Theoretical Physics Institute, University of Alberta, Canada — The concept of ionization-induced injection into the laser pulse to produce quasi-monoenergetic bunches of electrons from ultra-thin solid dense targets is analyzed. When the laser pulse propagates through semi-transparent foil the electrons from inner atom shells remain bound during the rise time of the laser pulse and are ionized by the laser intensity near its maximum amplitude, which satisfies the best injection condition for subsequent acceleration. The 2D3V PIC code PICNIC was used for simulation of a linearly polarized laser pulse with a wavelength $\lambda = 1.053\mu m$ normally incident onto nano-sized DLC target. We performed simulations for 3 cases: (1) 5 nm carbon foil ionized due to field ionization (FI); (2) the same, but already ionized foil, i.e. the foil in the form of a plasma slab with average charge $<Z> = 3.4$; (3) 42 nm carbon foil with FI. Comparison of the results obtained with different target models shows that a correct description of the interaction of a high contrast laser pulse with an ultra-thin solid dense target should include the FI effect. It was found that for the case (1) a bunch of quasimonoenergetic electrons from inner atom shells moves co-directionally with laser pulse and acquire energy $\sim m_e c^2 a^2/2$.

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