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Magneto-ionization laser wakefield assisted acceleration of GeV range quasimonoenergetic electron beams in He with CO2 impurity gas target IGOR GLAZYRIN, ARTEM KARPEEV, 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, University of Alberta, Edmonton, AB, Canada, WOJCIECH ROZMUS, Department of Physics, University of Alberta, Edmonton, AB, Canada — Quasimonoenergetic electron beam with maximum energy of 1 GeV and several mrad divergence has been generated in He gas with CO2 impurity via wakefield acceleration with 80 TW, 30 fs laser pulse at the Advanced Laser Light Source (ALLS) installation. These measurements are supported by 3D3V PICNIC simulations with the model used for the tunnel ionization accounting. Numerical analysis has indicated the continuous injection and the acceleration of liberated electrons from different atom shells of all gases. Electrons from inner shells were ionized near the peak of the laser pulse and were injected into and trapped by the wake. This mechanism of electrons selection is weakly operating. CO2 impurity increases the stability of subsequent trapping of electrons. Through simulations it has found that laser-driven wakefield configurations oscillate periodically changing the number of bubbles with electron bunches from one to several (three on the average). It leads to transverse beams centroid motion which is likely head-tail instability. Focusing magnetic field for the case of CO2 impurity is assisted in stabilization of the instability.

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