Laser-driven relativistic electrons for high energy density research

Andreev N E[1,2,@], Popov V S[1,2] and Rosmej O N[3]

[1] Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow 125412, Russia
[2] Moscow Institute of Physics and Technology, Institutskiy Pereulok 9, Dolgoprudny, Moscow Region 141701, Russia
[3] GSI Helmholtzzentrum für Schwerionenforschung GmbH, Planckstraße 1, Darmstadt 64291, Germany

[@] andreev@ras.ru

The efficient generation of relativistic electrons with an energy of tens of MeV in a plasma of near critical electron density was demonstrated at the laser intensities of $(3-5)\times 10^{19}$ W/cm^2 and a pulse duration of 1 ps. The collimated high energy electron beams reached effective temperatures that many times exceed those predicted by the ponderomotive Wilks scaling and carry charges of hundreds of nC. A good agreement between the experimental data and the results of the 3D-PIC simulations was obtained [1, 2].
Ultra-intense well-directed beams of MeV electrons and gamma-rays were generated at laser intensities that are relevant for the current short pulse high energy diagnostic lasers e.g. at NIF and LMJ. Application of the low-density polymer foams will result in a strong increase of their diagnostic potential in probing of high energy density matter.
Acknowledgments: The reported study was funded by the Russian Foundation for Basic Research and ROSATOM, research project No. 20-21-00150.

[1] Rosmej O, Andreev N E, Zaehter S, Zahn N, Christ P, Borm B, Radon T, Sokolov A, Pugachev L, Khaghani D, Horst F, Borisenko N, Sklizkov G and Pimenov V 2019 *New Journal of Physics*
[2] Rosmej O N, Gyrdymov M, Günther M M, Andreev N E, Tavana P, Neumayer P, Zähter S, Zahn N, Popov V S, Borisenko N G, Kantsyrev A, Skobliakov A, Panyushkin V, Bogdanov A, Consoli F, Shen X F and Pukhov A 2020 *Plasma Physics and Controlled Fusion* **62** 115024