Short electron bunches accelerated by laser wakefield at PALS for applications from electron diffraction to nuclear physics

Miroslav Krus*

Institute of Plasma Physics of the Czech Academy of Sciences, Department of Laser Plasma, Czech Republic
**krus@ipp.cas.cz*

Advances in the laser technology drive the development of charged particles´ plasma-based laser accelerators, being compact devices capable of electron bunch acceleration to several hundreds of MeV over milimeter distances. However, present-day laser accelerated electron beams lack the parameters and stability of modern, conventional RF accelerators.

Here, we present the recent experimental (using 400mJ-in-focus, 40fs, 808nm laser pulses available at PALS Research Infrastructure) and numerical results on the stabilization of the in-plasma-wave electron beam injection process by shock-wave-driven plasma-density downramp tailoring or perpendicularly crossed optically-driven electron bunch injection. Using these techniques, fundamental electron beam parameters can be fitted for production of high-quality beams used in various applications (e.g. electron diffraction, radiography, X-ray and radioisotope production, etc.).