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Characterisation of LWFA with realistic laser profiles for ESCULAP project

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A goal of ESCULAP [1,2] experiment is the external injection of photo-injector electrons bunch with consequent LWFA acceleration in the moderate density plasma cell.

In our configuration small fraction of LASERIX laser is send to the photocathode, and the rest is delivered to the plasma cell for the wake excitation.

Stability of the laser beam, its shape, “flatness”, duration, intensity etc. are crucial parameters for the reproducible shot-to-shot acceleration. In current paper we study numerically LWFA and evolution/propagation of flattened Gaussian profile of the laser approximating the experimental one. The study is performed for 10, 20 and 50 MeV externally injected electron beam.

[1] E. Baynard, et al., Nucl. Instrum. Meth. Phys. Res. A 909, 46 (2018).

[2] K. Wang, et al., “A Start to End Simulation of the Laser Plasma Wakefield Acceleration Experiment at ESCULAP”, in

Proc. 9th Int. Particle Accelerator Conf. (IPAC’18), pp. 1731–1734 (2018).

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