# Tunable quasi-monoenergetic LWFA electron beam

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Laser plasma acceleration of charged particles represents one of the most promising applications of ultraintense lasers. One of the most promising laser plasma acceleration mechanisms is laser wakefield acceleration (LWFA). This mechanism can be implemented to generate electron beams with energies in the range of tens MeV that are valuable for a variety of applications, such as investigation of the photonuclear reactions near threshold.

We have demonstrated the generation of energy-tunable quasi-monoenergetic electron beams by interrupting the acceleration process at different stages by introducing a sharp density spike created by a laser-induced blast wave [1]. Electron beams with tunable energies ranging from 6 to 12 MeV and an energy spread of 2 to 3 MeV were achieved by this approach experimentally. Energy tuning occurs during the deceleration phase. The spectrum is quasi-monoenergetic in a tuning range. Additionally, we conducted an extensive analysis of the 1D quasi-linear model of LWFA to elucidate this effect [2]. The analytical model provides a theoretical framework for understanding the generation of quasi-monochromatic energy-tunable electron beams through LWFA and offers accurate estimates of the electron beam parameters.

[1] Tsymbalov I, Gorlova D, Ivanov K, Starodubtseva E, Volkov R, Tsygvintsev I, Kochetkov Y, Korneev P, Polonski A and Savelev A 2024 *Phys. Rev. Letters (accepted)*

[2] Starodubtseva E, Tsymbalov I, Gorlova D, Ivanov K and Savelev A 2024 *Laser Physics Letters* **21** 075401