MATTER AND TECHNOLOGIES

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Generating high-quality high-energy ion beams from laser-driven relativistic-transparent plasma

With the help of theoretical analysis and particle-in-cell simulations, we propose a new regime of laser-driven self-trapping ion acceleration. This is a promising regime to high-quality high-energy controllable ion beams with currently available experimental conditions. Such ion beams have potential applications in many areas especially medical treatment of tumour and ultra-fast matter detection. For a given laser pulse, this regime provides the most energetic ion beams compared with other regimes of laser-plasma interaction. The self-trapping of ions happens localized close to the laser axis, resulting in highly directed quasi-mono-energetic ion beams. The output ion beam is adjustable by tuning the plasma density and the laser intensity. This allows the design of robust and controllable laser-plasma ion accelerators.

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