Laser acceleration of monoenergetic protons from ultra-thin foils in the Directed Coulomb Explosion regime.

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Coulomb Explosion of a double layer target (principal scheme - animation)

- Heavy ions are ionized by the laser pulse
- Electrons are expelled from the target by the laser pulse
- Light ions are accelerated in the charge separation field
- Heavy ion layer explodes due to the Coulomb repulsion of excess positive charge

ELECTROSTATIC FIELD

HEAVY IONS

LIGHT IONS

Parameters of simulation
Simulation box: 20 λ x 10 λ
Grid mesh size: λ/200
Laser pulse: 500 TW
Linearly polarized (z)
Focused: f/D=1.5
Foil: first layer Al\textsuperscript{+13}, electron density 400 n\textsubscript{0}, second layer H\textsuperscript{+}, electron density 30 n\textsubscript{0}

Directed Coulomb Explosion of a double layer target (2D particle-in-cell simulation results)

Accelerating Field

Longitudinal electric field

Spectrum

Ion density

protons

Aluminum ions

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