

Efficient Laser ion acceleration from foils and isolated targets

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We present our recent findings on laser efficient laser ion acceleration with various target systems.

One target system is based on a Paul-trap, which allows us to position sub-focus sized spherical targets (1 μm diameter) with sub-micrometer precision into the focus.

The other target system are thin plastic foils (with 10 - 200 nm thickness).

Experiments were conducted at the JeTi laser with a plasma mirror and dedicated pre-pulse.

For the spherical targets we find most energetic protons when the target is pre-expanded to near critical densities.

For foil targets, we identify a local maximum for pre-expanded targets in the range of critical densities, similar to spherical targets. Nevertheless, non pre-expanded foil targets lead to higher ion energies.

Both target systems lead to very high conversion efficiencies better than 20 MeV per Joule on target.

Next to the experimental results, this talk will address the underlying acceleration processes. While they differ significantly in some aspects, they still have some similarities. Strategies for future experiments will be presented.

Primary author: HILZ, Peter (Helholtzinstitut Jena)

Co-authors: SALAHELDIN, Israa Dhahran Salah Eldin; Dr GEBHARDT, Johannes (Ludwig-Maximilians-Universität München; Germany); SCHREIBER, Jörg (LMU Munich); ZEPF, Matt (Helmholtz Institut Jena); SHI, Mingyuan (Helmholtz Institute Jena); OSTERMAYR, Tobias (LMU München and MPI-Q)

Presenter: HILZ, Peter (Helholtzinstitut Jena)

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