FAKULTÄT für PHYSIK
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PHYSIK-DEPARTMENT
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MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 09.02.2012, 16^{15} Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1
Treffen zum gemeinsamen Kaffee 16 Uhr

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Advanced techniques in laser-ion acceleration: Conversion efficiency, beam distribution and energy scaling in the Break-Out Afterburner regime

In the past ten years, target normal sheath acceleration (TNSA) has been studied intensively, experimentally as well as theoretically. TNSA, however, predominantly accelerates protons by virtue of its acceleration mechanism. Recently, improved laser contrast and steadily increasing laser intensities made novel acceleration mechanisms, such as the radiation pressure acceleration (RPA) or the Break-Out Afterburner (BOA) accessible experimentally. These mechanisms efficiently couple laser momentum into all target ion species, making these mechanisms a promising and competitive alternative to conventional rf-accelerators on a much wider basis. However, little experimental research or simulations have up to now studied conversion efficiency or beam distributions, which is essential for advanced application, such as ion based fast ignition (IFI) or hadron cancer therapy. We here present for the first time experimental data addressing conversion efficiency and ion distribution scaling for both carbon C^{6+} ions and protons within the Break-Out Afterburner regime and the transit into the TNSA regime. Unique high resolution (in energy and angle) measurements of angularly resolved carbon C^{6+} and proton energy spectra for targets ranging from 30nm to 25 μm - recorded with a novel ion wide angle spectrometer (iWASP) - are presented and used to derive thickness scaling estimates. While the measured conversion efficiency for C^{6+} reaches up to 6%, peak energies of 1 GeV and 120 MeV have been measured for C^{6+} and protons, respectively.

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