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Experimental investigation of heavy ion energy loss in dense plasma, generated by laser induced soft X-rays

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We report on heavy ion energy loss experiments in dense carbon plasma heated by hohlraum generated X-rays.
The energy deposition of ions in plasmas is a key question in ICF simulations, for the evaluation of heavy ions as drivers and for research in the realm of ion driven fast ignition concepts. The GSI Helmholtzzentrum für Schwerionenforschung offers the unique possibility to use the high energy laser system PHELIX to create dense laser plasmas and to probe this with a heavy ion beam from the UNILAC accelerator.

With direct laser heating of thin carbon foils, fully ionized plasma with a temperature of up to 200 eV and a maximum electron densities of 1021 cm-3 can be created [1]. To reach higher plasma densities the foil has to be heated with intense X-rays. By converting laser light (150 J, 1.5 ns, 527 nm) in a spherical gold hohlraum (600 µm diameter) soft X-rays with radiation temperature of 100 eV are generated. These are transported into a secondary cylindrical hohraum where they heat two 100 µg/cm2 carbon foils. With this method we are able to create carbon plasmas with an electron density of 1022 cm-3 and an ionization degree of 4. These targets have been fabricated and characterized at the Detector- and Target laboratory of Darmstadt University.

The radiation temperatures in the primary and the secondary hohlraum as well as the plasma conditions were characterized [2] and compared with 2D-hydro simulations (RALEF 2D, [3]) and theoretical predictions [4].
In the first energy loss experiments with a Ca17+ ion beam with 4 MeV/u we observed an increase of the stopping power of up to 40%.

[1] A. Frank, A. Blazeiv et al. Energy loss of argon in a laser-generated carbon plasma. Phys. Rev. E, 81(2):026401, 2010
[2] T. Hessling, A. Blazevic et al. Time and spectrally resolved measurements of laser-driven hohlraum radiation, Phys. Rev. E, 84:016412, 2011
[3] M.M. Basko, J. Maruhn et al. An efficient cell-centered diffusion scheme for quadrilateral grids. J.Comput. Phys., 228:2175-2193, 2009
[4] G.D. Tsakiris, et al. Energy distribution in cavities by thermal radiation. Phys. Fluids B, 4:992-1005, 1992

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