# SYRL 2: Relativistische Laserplasmen

Zeit: Freitag 14:00–16:00 Raum: 6C

**Hauptvortrag** SYRL 2.1 Fr 14:00 6C

**Ultrafast proton acceleration in relativistic laser plasma** — •Peter Nickles[1], Matthias Schnürer[1], Thomas Sokollik[1], Sargis Ter Avetisyan[1], Wolfgang Sandner[1], Munib Amin[2], Toma Toncian[2], and Oswald Willi[2] — [1]Max-Born-Institut, Berlin, Germany — [2]Heinrich- Heine- Universität, Düsseldorf, Germany

We report on detailed investigations of ultrashort (˜ 40 fs,above 10E19 W/cm2) laser pulse driven ion acceleration from solid targets using sensitive single-shot particle diagnostic. Time- and spatially resolved ion/proton energy spectra and distributions, efficiencies in dependence on the laser pulse parameters such as pulse duration, intensity, and contrast ratio were studied and acceleration scenarios are discussed. The recorded distributions show that preferentially lower energetic protons/ions (<1MeV) have a wiggled structure, whereas protons with higher energy have an undisturbed "continuous" distribution, witnessing of a fixed source size. Among the generation and characterization of laser driven ions/protons, the search for quasi-monoenergetic ions plays an outstanding role. Results to this topic showing bunches of "mono-energetic" deuterons about 2 MeV are given.

Furthermore we report on first "streaked" deflectometry of the development of fields at the rear side of a secondary plasma. Comparing this measurements of the temporal and 1D-spatial development and complimentary two-dimensional spatial snapshots with ray tracing calculations we inferred the scenario of an expanding field at the target rear side due to charge-up, charge compensation and ion front propagation processes.

**Hauptvortrag** SYRL 2.2 Fr 14:30 6C

**Ionenbeschleunigung mit intensiven Laserpulsen** — •Heinrich Schwoerer, Sebastian Pfotenhauer, Oliver Jäckel und Jens Polz — Institut für Optik und Quantenelektronik, Friedrich-Schiller-Universität, Max-Wien-Platz 1, 07743 Jena

Mit ultrakurzen und intensiven Lichtfeldern können Ionen auf kinetische Energien von vielen MeV beschleunigt werden. Die erzeugten Ionenstrahlen unterscheiden sich in Dauer, Intensität und geometrischen Strahlparametern deutlich von konventionell beschleunigten Ionenstrahlen. Der intensive Laserpuls wird dazu auf eine dünne Folie fokussiert, erzeugt darauf ein Plasma und beschleunigt zunächst Elektronen auf relativistische Energien. Diese Elektronen durchdringen die Folie und bauen ein im Vergleich zur Lichtperiode statisches Feld zwischen ihnen und der Folie auf, in dem Atome ionisiert und beschleunigt werden können. Wir berichten über Stand und Verständnis dieser neuen Beschleunigungsmethode und diskutieren insbesondere die Möglichkeiten zur Einflußnahme auf die Energieverteilung der Ionen.

**Hauptvortrag** SYRL 2.3 Fr 15:00 6C

**High-Intensity Laser Ion Acceleration** — •Jörg Schreiber[1,2], Friedhelm Bell[1], Florian Grüner[1], Michael Geissler[2], Stefan Karsch[2], Andreas Henig[1,2], Ulrich Schramm[3], Manuel Hegelich[4], Ferenc Krausz[1,2], and Dietrich Habs[1] — [1]Department für Physik, Ludwig-Maximilians-Universität München, Germany — [2]Max-Planck-Institut für Quantenoptik, Garching, Germany — [3]Forschungszentrum Rossendorf, Dresden, Germany — [4]Los Alamos National Laboratory, Los Alamos, NM, USA

Electron and ion acceleration with highly intense laser pulses is a rapidly developing field of relativistic laser-plasma physics. During the last years the ultrashort (femtoseconds) high-density electron bunches could be produced with a nearly mono-energetic spectrum and GeV energies became accessible with table-top class lasers. While such electron bunches are produced in gases, at laser irradiated foils the relativistic electrons produce charge separation fields well above $10^{12}$ V/m which in turn accelerate a large number of ions ($10^{10} - 10^{13}$) with a small transversal emittance ($< 0.004\text{mm} \cdot \text{mrad}$) within less than one picosecond. The usually broad energy distribution of the ions could be narrowed by special target designs in two recent experiments. The production of relativistic solid density ion bunches will become possible in the near future. The application of laser accelerated ion beams could reach from compact fast-ion injectors for conventional particle accelerators over fast ignition for inertial confinement fusion to oncology and radiotherapy with ion beams.

**Hauptvortrag** SYRL 2.4 Fr 15:30 6C

**Proprieties of Laser Triggered Micro Lens for Energy Selection and Focusing of MeV protons** — •Toma Toncian — Institut für Laser- und Plasmaphysik, Heinrich-Heine-Universität Düsseldorf, 40225 Düsseldorf, Germany

The acceleration of MeV ions from the interaction of high- intensity laser-pulses with solids has major applicative prospects because of the high beam quality of this beams. However this beams are polyenergetic and divergent at the source. With the aid of a laser triggered micro lens tunable energy selection and focusing of MeV proton beams has been recently demonstrated (Toncian et. al. Science 312, 410 (2006)). A high intenstity laser pulse is focused onto the wall of a hollow cylinder. The radial electric field associated to plasma expansion from the walls acts as a focussing lens on positive charged ions injected allong the axis of the cylinder. Here we present a more detailed studies of the proprieties of the laser triggered lens. Specially the dependence on triggering time and triggering pulse intensity of the focal length is addressed. The electron transport in the lens is discussed.