Internship, B.Sc, M.Sc. and Ph.D. opportunities in Relativistic Laser Plasma Research at the Helmholtzinstitute Jena (Experimental)

In 2018, the Nobel prize in physics was awarded for the invention of a technique called chirped pulse amplification (CPA). CPA paved the way for the development of high intensity laser systems. These systems allow the generation of extremely short and energetic bursts of light.

The light pressure in the focal spot of such a high power laser system amounts to a few billion bars which enables us to generate extreme states of matter, so called relativistic plasmas. We use such relativistic plasmas to drive secondary sources, such as X-Rays, electron and ion beams.

In transparent plasma environments, electrons are typically accelerated to energies up to gigaelectronvolts over an acceleration distance of just a few centimeters. Ion acceleration uses opaque plasmas. Here, ions are accelerated to some tens of megaelectronvolts in a few micrometers.

In our project we investigate the interaction of a relativistic laser pulse with small-scale transparent plasmas. These small-scale low density plasmas can only be obtained by the use of sophisticated methods which represent the cutting edge of present day technology. The experiments with these new kind of targets are employed either at our own laser facilities (Jeti 200, Polaris) or at lasers of our cooperation partners (Texas, South Korea, Munich, Darmstadt etc). We plan to study the generation of UV/X-Ray and particle beams from these new kind of targets.

Possible projects are:

- Target development (2PP, FCAD, CVD, VD, ALD etc) (M.Sc.)
- Controlled target pre expansion and characterization by e.g. inline holography (M.Sc. or Ph.D.)
- Development of Diagnostics (Particle and UV spectrometers) (M.Sc.)
- Investigation of the coherent acceleration mechanisms in mass limited near- and sub-critical targets (Ph.D.)
- Measurement and characterization of emitted radiation from a volumetric driven relativistic plasma (Ph.D.)
- Preparation of radial polarization states in a high intensity laser. (M.Sc.)
- Using radial polarization in combination with mass limited targets for proton/ion acceleration (Ph.D.)
- Intensity enhancement in Conical Targets (M.Sc.)

Obviously we also have various interesting opportunities for bachelor projects and internships. If we caught your attention and you would like to gain more insight into what we do and contribute to our project, we invite you to visit us for a chat and lab-tour.

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