NIC Seminar

Topic: **Ion and electron accelerations from solid foils by intense laser pulses**

Speaker: Dr. Bin Qiao, Centre for Plasma Physics, Queen's University Belfast

Contents: The interaction of ultra-high intensity laser pulses with solid foils has opened new ways to generate high-energy ion beams and relativistic electron beams. Two different regimes exist for this interaction, which can be respectively applied for efficient ion and electron accelerations.

If the foil is sufficiently thick so that the laser normalized amplitude a_0 is smaller than the maximum charge separation field $2\pi n_0 l_0/n_c\lambda$ (n_0 and l_0 are foil density and thickness) when all foil electrons are separated from the ions, the quasi-equilibrium electrostatic field is generated in the form of either a single spike or a rear surface sheath, which can efficiently accelerate ions. Recent exciting results have made it very clear that radiation pressure acceleration (RPA) may have great potential to revolutionize laser-driven ion acceleration. However, the stability issue of RPA has still not been solved so far. In this talk, a stable relativistic ion acceleration regime for thin foils irradiated by circularly polarized laser pulses will be suggested. In this regime the „light-sail" stage of RPA for ions is smoothly connected with the initial relativistic „hole-boring" stage, and a defined relationship between laser intensity I_0, foil density n_0 and thickness l_0 should be satisfied. For foils with a wide range of n_0, 2D PIC simulations with the code ILLUMINATION have verified this regime. It is shown for the first time by 2D simulations that high-density monoenergetic ion beams with energy above GeV/u and divergence of 10° are produced by circularly polarized lasers at intensities of $10^{22}W/cm^2$, which are within reach of current laser systems.

Time: Tuesday, 7 April 2009, 14:00

Venue: Besprechungsraum 1, Jülich Supercomputing Centre

Anyone interested is cordially invited to participate.

sgd Dr. Sabine Höfler-Thierfeldt

Verteiler II