"Physics with intense lasers"

The PHELIX-laser system at GSI-Darmstadt provides a great opportunity for a variety of experiments in the field of High Energy Density physics, particle acceleration, generation of MeV gamma-sources and laser driven nuclear reactions. During the last decade twelve experimental projects using intense laser beam or a combination of laser and ion beams have been carried out at GSI with participation of students from the Plasma Physics group of the Goethe University.

In the talk I will highlight two experimental campaigns: one on measurements of the increased energy loss of heavy ions in laser produced plasmas, where a worldwide unique combination of the ion beam from the UNILAC and the synchronized high energy ns PHELIX laser pulse was used. Another one deals with the interaction of sub-ps laser pulse of relativistic intensity with structured polymer targets that leads to the production of very directed, highly charged electron beams with a cut-off energy up to 100 MeV.

Interaction of such energetic electrons with high Z materials gives rise to high yield of gamma-driven nuclear reactions with threshold energies beyond 20 MeV. This opens a new path to nuclear photonics at rather moderate relativistic laser intensities.