FAKULTÄT für PHYSIK
LUDWIG-MAXIMILIANS-UNIVERSITÄT
MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 07.12.2017, 16^{15} Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1
Treffen zum gemeinsamen Kaffee 16 Uhr

Dr. Vincent Bagnoud

(GSI Darmstadt und TU Darmstadt)

Performance of the PHELIX high-power laser facility and upcoming upgrade plans

The PHELIX laser facility at GSI in Darmstadt is a high-energy multi-100-J laser operated as a user facility opened to the scientific community from all over the world. Access to PHELIX is granted on a proposal/review basis where the scientific merit of the proposals is in the foreground and scientist come to exploit the worldwide unique combination of a high-energy laser and the ion beam of GSI's heavy ion accelerator. One of the unique features of the PHELIX laser is the versatile temporal structure of the pulses generated in the front-end. The short subpicosecond pulses are generated in a broadband front end at a repetition rate of 10 Hz with a nanosecond noise level adjustable between 10^{-7} and 10^{-12}. This is obtained by pre-amplifying the laser pulses in a picosecond parametric amplifier and distributing the gain in the first two amplifiers between parametric and standard laser amplification. With the highest temporal contrast option, PHELIX enables shooting sub-micrometer thick foils, one of the requirements for modern high-intensity lasers. For experiments requiring a significant pre-ionization of the target, the background noise can be increased and an additional programmable nanosecond pre-pulse can be added, enabling a wide range of experiments. Being based on neodymium-doped glass as amplification medium, thermal effects in the amplifiers limit the repetition rate of the laser to one shot every 90 minutes. Adaptive optics techniques based on equipment developed in-house are employed to compensate for these thermal effects and in particular prompt aberration happening during the shot. Recently, an upgrade of the pre-amplifier has been made to increase the repetition rate of this amplifier section to 3 shots/minutes at an energy level up to 20 J. In addition, we are currently working on active cooling strategies to reduce the total cooling time of the main amplifier to a few minutes. In this presentation, I will go over the current performance of the facility with an emphasis on the temporal and spatial technical aspects that are peculiar to the laser. In a second part, I will describe the upgrade plans for PHELIX, including the Helmholtz Beamline project at the FAIR facility.

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