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Future challenges in Multi Petawatt High Repetition Rate Laser System

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The development of the ultrafast laser technology has enabled the generation of laser pulses with peak powers in the 1PW regime, opening up new fields of research and possible applications. Projects have been established to go beyond the 1PW level pushing laser technology to the limit.

Whilst, there have been significant advances in the peak power of laser systems, the repetition rate of high-energy laser systems has limited the possible applications of these systems.

At the Central Laser Facility there are two different interrelated projects to push these limits: the 20PW project and Dipole 100. The 20PW project is aimed at reaching 20PW peak power at a relatively low repetition rate using a novel amplification technique (OPCPA), while Dipole 100 is aiming to obtain laser pulses of 100J at 10Hz.

In this paper these two projects will be presented, focussing on the advantages and limitations for possible applications. The challenges in combining these two goals, obtaining high peak power and high repetition rate, will then be discussed.

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