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Proton acceleration studies with ultrashort PW pulses at DRACO

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With the recent upgrade, the DRACO Ti:Sa laser at Helmholtz-Zentrum Dresden –Rossendorf (HZDR), became a multi-beam, multi-target-area laser facility, delivering pulses of 30 fs pulse duration with energies of up to currently 30 J. The implementation of a “plug-in” plasma mirror allows to study the scaling of ion acceleration performance with laser pulse energy, temporal pulse contrast and target thickness while all further, typically facility-dependent conditions remain fixed. For the studies, a suite of single-shot, online diagnostics to monitor pre-interaction laser pulse parameters, laser-plasma interaction and ion beam characteristics was employed. In addition, a proton beamline based on pulsed solenoids was characterized in order to deliver proton pulses into a $5 \times 5 \times 5 \text{ mm}^3$ target volume with homogenized lateral and depth dose profiles and average dose rates relevant for experimental cancer therapy studies.

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