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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.

Primary author: Dr SCHLENVOIGT, Hans-Peter (Helmholtz-Zentrum Dresden - Rossendorf)

Co-authors: Mr JAHN, Alexander (Helmholtz-Zentrum Dresden-Rossendorf); Mr KROLL, Florian (Helmholtz-Zentrum Dresden-Rossendorf); Mr BRACK, Florian-Emanuel (Helmholtz-Zentrum Dresden-Rossendorf); Dr METZKES, Josefine (Helmholtz-Zentrum Dresden-Rossendorf); Dr ZEIL, Karl (Helmholtz-Zentrum Dresden-Rossendorf); Mr GAUS, Lennart (Helmholtz-Zentrum Dresden-Rossendorf); Mrs OBST, Lieselotte (Helmholtz-Zentrum Dresden-Rossendorf); Mr REHWALD, Martin (Helmholtz-Zentrum Dresden-Rossendorf); Mr GEBHARDT, René (Helmholtz-Zentrum Dresden-Rossendorf); Mr BOCK, Stefan (Helmholtz-Zentrum Dresden-Rossendorf); Dr KRAFT, Stephan (Helmholtz-Zentrum Dresden-Rossendorf); Mr ZIEGLER, Tim (Helmholtz-Zentrum Dresden-Rossendorf); Prof. SCHRAMM, Ulrich (Helmholtz-Zentrum Dresden-Rossendorf); Mr HELBIG, Uwe (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter: Dr SCHLENVOIGT, Hans-Peter (Helmholtz-Zentrum Dresden - Rossendorf)

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