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Non-Maxwellian electron distributions by direct laser acceleration in near-critical plasmas T. TONCIAN, C. WANG, A. AREFIEV, E. MCCARY, A. MEADOWS, J. BLAKENEY, C. CHESTER, R. ROYCROFT, University of Texas at Austin, H. FU, X.Q. YAN, Peking University, J. SCHREIBER, Ludwig-Maximilians-University, Munich, I. POMERANTZ, H. QUEVEDO, G. DYER, E. GAUL, T. DITMIRE, B.M. HEGELICH, University of Texas at Austin
— The irradiation of few nm thick targets by a finite-contrast high-intensity short-pulse laser results in a strong pre-expansion of these targets at the arrival time of the main pulse. The targets will decompress to near and lower than critical electron densities plasmas extending over lengths of few micrometers. The laser-matter interaction of the main pulse with such a highly localized but inhomogeneous the target leads to the generation of a channel and further self focussing of the laser beam. As measured in a experiment conducted with the GHOST laser system at UT Austin, 2D PIC simulations predict Direct Laser Acceleration of non-Maxwellian electron distribution in the laser propagation direction for such targets. The hereby high density electron bunches have potential applications as injector beams for a further wakefield acceleration stage. This work was supported by NNSA cooperative agreement DE-NA0002008, the DARPA's PULSE program (12-63-PULSE-FP014) and the AFOSR (FA9550-14-1-0045).

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