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TNSA using twisted laser pulses and shaped targets CAMILLA WILLIM, JORGE VIEIRA, GoLP, VICTOR MALKA, Weizmann Institute of Science — Multi-MeV proton beams find various applications such as proton beam therapy or "fast ignition" of inertial confinement fusion targets. Target normal sheath acceleration (TNSA) driven by short intense laser pulses is, in this context, a well-established proton acceleration model. The generation of multi-MeV proton beams with ultrashort duration (ps) and a high number of protons in a bunch (10^{11} – 10^{13}) has been successfully demonstrated in experiments, but beam properties still need improvement for applications. Improving the properties of TNSA schemes is thus very important for future progress. Here, we explore the phase-space properties of protons accelerated from shaped targets by intense lasers with orbital angular momentum (OAM) and discuss how these lasers could be used to address key issues in proton acceleration in plasma, such as their divergence and energy. The self-consistent laser—plasma dynamics is investigated analytically and by relying on three-dimensional particle-in-cell simulations in OSIRIS.

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