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Numerical investigation of new regimes in laser-plasma and laser-solid interactions R.M.G.M. TRINES, KATE LANCASTER, PETER NORREYS, CCLRC Rutherford Appleton Laboratory, LUIS SILVA, RICARDO FONSECA, Instituto Superior Tecnico, Lisbon, Portugal, SIMON HOOKER, Oxford University, Oxford, UK — The steady increase in the capabilities of the world's strongest lasers opens up parameter regimes for laser-plasma and laser- solid interaction experiments that were inaccessible before. This is even more true if one considers projected upgrades, such as the Vulcan 10 PW upgrade or the Astra Gemini system (two 50 fs pulses of 500 TW each). In order to become familiar with the physical processes that dominate laser-matter interactions in these regimes, extensive numerical investigations are needed. In this paper, we present the results of particle-in-cell simulations of laser-plasma interactions for electron acceleration in the blowout regime, using Astra Gemini-style pulses, as well as laser-solid interactions for fast ignition fusion research, using Vulcan Petawatt-style pulses. The simulations have been performed using the Osiris framework. New features of the interaction processes that are a direct consequence of the elevated pulse capabilities will be highlighted, and consequences for future experiments will be discussed.

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