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The formation stage of collisionless shocks MICHAEL MARTI, GI-ANFRANCO SORASIO, RICARDO FONSECA, LUIS SILVA, GoLP/CFP, Instituto Superior Tecnico, Lisbon, Portugal, WARREN MORI, UCLA — Recently we have shown that it is possible to launch collisionless shocks by interaction of ultra intense lasers with solid targets [1]. In this work, we explore the physics of the formation stage of collisionless shock structures by comparing the results of the numerical simulations carried out with osiris 2.0 with our theoretical predictions. The different driver mechanisms - i.e. laser vs. piston - are discussed and compared, and critical parameters such as jump conditions, electron temperature, electron trapping, and shock velocity are examined. The influence of the plasma parameters on the maximum shock velocity is explored in the regime of different plasma compositions and target shapes, and the results are theoretically investigated. The laser/piston - induced shocks are also probed in absence of a preformed plasma by shutting the laser on a non-ionized target. The effects of collisions on the shock structure and properties are investigated. Shock guiding and front control is explored through shaping of the density/temperature distribution in the targets. [1] Luis O. Silva, Michael Marti, Jonathan R. Davies, et al, Phys. Rev. Lett. 92, 015002 (2004)

Michael Marti
GoLP/CFP, Instituto Superior Tecnico, Lisbon, Portugal

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