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Laser-plasma mirrors: from electron acceleration to harmonics generation[1] MAXENCE THÉVENET, MAïMOUNA BOCOUM, JÉRÔME FAURE, Laboratoire d'Optique Appliquée, Palaiseau, ADRIEN LEBLANC, HENRI VINCENTI, FABIEN QUÉRÉ, SPAM, CEA-IRAMIS — Accelerating electrons in the $> 10\,\mathrm{TV/m}$ fields inside an ultrashort ultraintense laser pulse has been a long-standing goal in experimental physics, motivated by promising theoretical predictions. The biggest hurdle was to have electrons injected in the center of the laser pulse. Recent experimental and numerical results[2] showed that this problem could be solved using a plasma mirror, i.e. an overdense plasma with a sharp (¡laser wavelength) density gradient on its front side, leading to a 10 MeV 3 nC electron beam. Using particle-in-cell simulations, the ejection process was identified[3] as a push-pull mechanism occuring at each laser period, resulting in a train of attosecond electron bunches injected in the reflected field. We present a study and a model of this process, and show the gradient characteristic length is the crucial parameter for this phenomenon. Finally, the electron ejection process was put into perspective with respect to the high harmonic generation mechanisms on plasma mirrors[4], giving new insights into the motion of the plasma mirror surface.

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[2]M. Thévenet, **Nat. Phys. 12**, 355 (2015)
[3]M. Thévenet, **Phys. Plasmas 23**, 063119 (2016)
[4]M. Bocoum, **Phys. Rev. Lett. 116**, 185001 (2016)

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