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**Self-Steepening of intense laser pulses in plasmas** JORGE VIEIRA, FREDERICO FIÚZA, LUIS SILVA, GoLP/Centro de Física dos Plasmas, Instituto Superior Técnico — In state-of-the-art Laser Wake Field Acceleration (LWFA) experiments [1], the self-modulations of the laser pulse (both transverse and longitudinal) play an important role in the enhancement of the plasma wave, which can trap, accelerate and lead to quasi-mono-energetic electron beams. In this work, the self-steepening of intense laser pulses is studied analytically resorting to the photon-kinetic theory [2]. Rates for the growth of self-steepening in the early laser propagation are provided in the long and short pulse limits, and in the weakly and ultra relativistic regimes. Thresholds for the on-set, maximum and minimum growth of self-steepening are determined. We find very good agreement between the analytical model and one-dimensional PIC simulations with OSIRIS [3]. Implications of our results to state-of-the-art LWFA experiments are discussed.

[1] W.P. Leemans et al Nat. Phys., 2 (10), 696-699 (2006)

[2] L.O. Silva et al, IEEE TPS 28 (4) 1128-1134 (2000)

[3] R. A. Fonseca et al, LNCS 2331, 342-351, (Springer, Heidelberg, 2002).

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