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Stochastic Heating in High Intensity Laser-Plasma Interaction. Application to the Wake Field Acceleration Process ALAIN BOURDIER, XAVIER DAVOINE, MATHIEU DROUIN, LAURENT GREMILLET, ERIK LEFEBVRE, CEA/DAM Ile-de-France, BP12, 91680 Bruyères-le-Châtel, France — Recently, PIC simulations results published by Tajima et al. and Sheng et al. have shown that chaos can play an important role in the efficient electron heating observed in laser-plasma interaction at very high intensities. These results led us to investigate the conditions under which significant stochastic heating is likely to take place. First, we shall consider the dynamics of a single charged particle in the field of a high intensity wave propagating in an unmagnetized vacuum or plasma. In a second part, the effect of a constant homogeneous magnetic field will be discussed. Third, in the case of a plasma interacting with several electromagnetic waves, the use of Chirikov's criterion to predict the conditions favoring stochastic heating will be presented. Finally, it will be shown that when considering a low density plasma interacting with a high intensity wave perturbed by a low intensity counterpropagating wave, stochastic heating can provide electrons with the right momentum for trapping in the wake field and efficient acceleration.

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