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Vlasov-Fokker-Planck modelling of magnetic field generation by laser speckles in nanosecond laser plasma interactions ALEXANDER THOMAS, University of Michigan, ROBERT KINGHAM, CHRISTOPHER RIDGERS, Imperial College — The magnetic fields that can develop in laser heated plasmas can be significant, in that their presence affects the magnitude and direction of the particle fluxes, e.g. electron heat flux, and therefore the long time evolution of the system. This evidently has consequences for inertial fusion energy applications, as the coupling of the laser beams with the walls or pellet and the development of hot spots are all critical. Presented here are the first fully kinetic two-dimensional Vlasov-Fokker-Planck simulations of nanosecond laser-plasma interactions to include self-consistent magnetic fields, hydrodynamic plasma expansion and anisotropic electron pressure. Inverse bremsstrahlung laser heating and non-local electron transport lead to the development of the collisional analogue of the Weibel electromagnetic instability. The instability is seeded by an initial linear growth of magnetic fields generated by the anisotropic electron distribution of laser speckles. This can lead to the generation of significant magnetic fields over the coherence time-scale of the speckles, which affects the heat transport and hydrodynamics for longer time-scales.

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