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The Effect of the Self-Magnetic Field on the Current Limit in a Laser Wakefield Accelerator (LWFA) LING-CHIEH TAI, Ntl. Tsing Hua Univ.Univ., Hsinchu, Taiwan, PENG ZHANG, School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore, WEE-SHING KOH, Institute of High Performance Computing, Singapore, LAY-KEE ANG, School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore, SHIH-HUNG CHEN, Dept. of Physics, Ntl. Central Univ., Jhongli, Taiwan — The challenge for the development of LWFA is achieving a nC- and GeV-level electron beam. Previous experiments [1] produced a GeV electron beam with total charges 30 pC, which is much less than the theoretical prediction [2]. The discrepancy might be due to the space charge and self-magnetic fields in the electron beam. The electrostatic diode model [3] for the space-charge-limited current has been developed and verified by the simulation. In order to understand the effect of the self-magnetic field on a relativistic electron beam, particle-in-cell simulations with electrostatic and electromagnetic models are performed, respectively. The simulation results can help the development of a new theoretical model based on a parabolic potential profile, which can be applied on more precise predictions of the limited currents in LWFA. 1. W. Leemans et al., Nature Phys. 2, 696 (2006). 2. W. Lu et al., Phys. Rev. ST Accel. Beams 10, 061301 (2007). 3. L. K. Ang et al., Phys. Rev. Lett. 98, 164802 (2007).

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