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Electron beam collimation by self-generated magnetic fields in 10ps relativistic laser matter interaction[1] M.S. WEI, R. STEPHENS, GA, R. MISHRA, A. SOROKOVIKOVA, J. PEEBLES, C. MCGUFFEY, L. JARROTT, F. BEG, UCSD, Y. SENTOKU, UNR, H. MCLEAN, P. PATEL, LLNL, W. THEOBALD, LLE — Generation and transport of an intense, collimated fast electron beam in relativistic laser plasma interaction (LPI) is crucial for applications such as fast ignition. To date, most studies were limited to sub-ps pulses with energies of ≈0.1kJ. We have extended such investigation to 10ps pulse duration using the high-intensity high-contrast OMEGA EP laser with energies up to 1.5kJ to study beam collimation by self-generated magnetic fields. Targets are multi-layered solid foils consist of an Al substrate, a buried Cu layer and a thick CH back layer. Similar targets containing a thin (<10μm) Au layer buried ≈10μm beneath the front Al layer are also used to examine the effect of transport material on beam collimation. Fast electron beam profile is diagnosed by 2D imaging the induced Cu Kα emission. Kα images from the Al transport targets show that 10ps LPI with the high-contrast pulses generate a more confined electron beam than that with low-contrast pulses, but with a large shot-to-shot variation. The Au transport targets consistently produce a stable, better-collimated electron beam with a spot size ≈50μm after propagating ≈150μm. Collisional PIC modeling results agree with the experiments.

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