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Expansion dynamics of foil plasma irradiated by picosecond relativistic laser NATSUMI IWATA, TAKAYOSHI SANO, Institute of Laser Engineering, Osaka University, KUNIOKI MIMA, The Graduate School for the Creation of New Photonics Industries, YASUHIKO SENTOKU, Institute of Laser Engineering, Osaka University — Petawatt lasers with picosecond (ps) pulse durations become available today. In the experiments, target normal sheath acceleration (TNSA) of ions with higher energies than those predicted by the isothermal plasma expansion model [1] has been observed [2]. In over-ps laser-foil interactions, the fast electron temperature increases temporally beyond the ponderomotive scaling, which results the non-isothermal TNSA [3]. Such an electron heating is triggered by the transition to the blowout phase due to the change of the pressure balance at the laser-plasma interface [4]. We here study the expansion dynamics of foil plasmas in the over-ps regime. In PIC simulations, we found that the expanding tenuous plasma forms a skirt-like density profile in the blowout phase, where laser heating and expansion cooling are balanced to keep the sheath electric field strength constant. The expansion dynamics and its effect on the electron heating will be discussed. [1] P. Mora, Phys. Rev. Lett. 90, 185002 (2003). [2] A. Yogo et al., Sci. Rep. 7, 42451 (2017); D. Mariscal et al., Phys. Plasmas 26, 043110 (2019). [3] N. Iwata et al, Phys. Plasmas 24, 073111 (2017). [4] N. Iwata et al., Nat. Commun. 9, 623 (2018).

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