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A new model for TNSA in the multi-ps laser-foil interactions KUNIOKI MIMA, The Graduate School for the Creation of New Photonics Industries, NATSUMI IWATA, AKIFUMI YOGO, SHOTA TOSAKI, KEISUKE KOGA, HIDEO NAGATOMO, Institute of Laser Engineering, Osaka University, YASUAKI KISHIMOTO, Graduate School of Energy Science, Kyoto University, HIROAKI NISHIMURA, HIROSHI AZECHI, Institute of Laser Engineering, Osaka University — In laser-matter interactions in the intensity level of 10^{18} W/cm², a few tens MeV ions can be generated. Ion acceleration in the interaction of thin foils with sub ps-1 ps laser pulses has been described conventionally by the self-similar plasma expansion theory assuming an isothermal condition [1]. Recently, an ion acceleration experiment using multi-ps laser pulses from kilojoule class laser LFEX was conducted [2] where the large spot size of 70 μ m with the peak intensity 2.3×10^{18} W/cm^2 results electron heating and ion acceleration exceeding the conventional 1D isothermal model. To understand such an interaction in the multi-ps regime where the electron heating during the laser irradiation is a key ingredient, we here present a new model for plasma expansions that takes the time variation of electron temperature, i.e. sound velocity, into account. Based on the temperature evolution obtained by a PIC simulation corresponding to the LFEX experiment, the theory was validated by comparing the maximum ion energy between theory and simulations. [1] A. Yogo, K. Mima, N. Iwata et al., submitted to Nat. Comm. [2] P. Mora, Phys. Rev. Lett. 90, 185002 (2003).

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