Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Generation mechanism of power law energy distribution in an expanding thin-foil plasma irradiated by intense lasers[1] NATSUMI IWATA, YASUHIKO SENTOKU, TAKAYOSHI SANO, Institute of Laser Engineering, Osaka University, KUNIOKI MIMA, The Graduate School for the Creation of New Photonics Industries — Power law energy spectra consisting of high energy particles have been observed ubiquitously in nature such as cosmic rays in astrophysical plasmas, and are considered to be generated via multiple-scattering processes in electric/magnetic/electromagnetic fields. However, the critical details of the acceleration, diffusion and relaxation processes that lead to the observed superthermal distributions have not understood completely. In intense laser-produced plasmas, the strong laser field in the intensity level exceeding 10^{18} W/cm^2 and self-generated fields play a role in stochastic multiple-scattering which dominates the electron acceleration and heating [1, 2]. In this study, by using the particle-in-cell simulation, we found that the high energy tail of the electron energy spectrum becomes power law distribution, so called the kappa distribution [3], in the interaction between a thin-foil plasma and a multi-picosecond high intensity laser. We discuss the generation mechanism of the power law tail relating to the multiple-scattering of electrons in the expanding foil plasma in details. [1] Y. Sentoku et al., Phys. Rev. Lett. 90, 155001 (2003). [2] N. Iwata et al., Phys. Plasmas 24, 073111 (2017). [3] A. Hasegawa et al., Phys. Rev. Lett. 54, 2608 (1985).

[1]This study is supported by a JSPS KAKENHI No. JP15K21767.

Natsumi Iwata
Osaka University

Date submitted: 14 Jul 2017 Electronic form version 1.4