# Distortion of bulk-electron distribution function and its effect on core heating in fast ignition plasmas

H. Matsuura, Y. Nakao, T. Johzaki[a]

*Applied Quantum Physics and Nuclear Engineering, Kyushu University, 744 Motooka, Fukuoka 819-0395, Japan*
*[a]Institute of Laser Engineering, Osaka University, Suita, Osaka, Japan*

mat@nucl.kyushu-u.ac.jp

To realize the energy production by a fast ignition scheme, detailed understanding of the energy-transfer process from laser-produced (LI) fast electron to dense core plasma is necessary. A part of the energies carried by fast electrons may be transferred to core plasma via electromagnetic forces induced by energetic electrons. In a dense plasma, however, collisional interaction is dominant for the energy-transfer process. In most of the previous studies[1], the energies transferred from LI-fast to bulk electrons has been estimated without considering the distortion of bulk-electron distribution function. The purpose of this paper is to examine whether a distortion of the bulk-electron distribution function from Maxwellian due to collisions with LI-fast electron can be appreciable or not, and whether the distortion can be effective on the bulk plasma heating or not.

For simplicity, we focus our attention only on the collisional energy transfer process. The Fokker-Planck (FP) equations for bulk and energetic electron distribution functions $f_a(\upsilon_{//},\upsilon_{\perp})$ ($\upsilon_{//}$ and $\upsilon_{\perp}$ represent parallel and vertical velocity components relative to the fast-electron injection direction) are simultaneously solved, and energy deposited from LI-fast electron to bulk plasma is evaluated. The Trubnikov-Rosenbluth potentials are iteratively computed at every time steps in 2D velocity space considering both, i.e. bulk and LI-fast electron, distribution functions. The FP simulation shows that when bulk electron is assumed to be Maxwellian, deposited power from LI-fast to bulk electrons per unit time tends to be overestimated compared with the case when distortion process of the bulk electron distribution is considered.

[1] See, for example, Sentoku Y., et al., Phys. Plasmas **11**(2004) 3083,
Yokota T., et al., Phys. Plasmas, **13** (2006) 022702.