# Integrated Simulations for Ion Assisted Fast Ignition using Low-density Foam Structured Targets

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Energy coupling from fast electrons to the core in FIREX experiments at ILE, Osaka University was found to be quite low due to too high slope temperature and too large divergent angle of fast electrons [1]. Thus, fast electron guiding by the external magnetic field and pulse contrast improvement of the heating laser are introduced into up-to-date FIREX experiments [2]. To enhance the core heating, the ion assisted fast ignition scheme is also suggested, where low-density CH foam is introduced in front of the cone tip as a ion beam generator to adapt the radiation pressure ion acceleration [3], and additional core heating by proton ($H^+$) and carbon ($C^{6+}$) beams is expected [4,5]. This simple design can reduce core-arrival time lags among different energy particles and not only fast electrons but also energetic ions with wide energy range can be used to heat the core. In addition, this design makes it easy to introduce the ion assisted fast ignition scheme into currently used Au cone-guided targets in FIREX experiments.

A divergence angle of energetic ions is investigated by 2D PIC simulations and found to be smaller than that of fast electrons but still large to efficiently hit the core using the simple unstructured targets. Thus structured targets for the ion generator are needed to improve the ion beam properties, and improvements for the divergence angle are confirmed. Although these structures also affect characteristics of fast electrons, and overall estimation of core heating by both fast electrons and energetic ions is required. So integrated simulations, in which particle data in 2D PIC are transferred into the source term in 2D core heating code, are carried out to evaluate the core heating properties to optimize the target structure for maximizing energy coupling.

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