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Control of Electron Beam Using Strong Magnetic Field for Efficient Core Heating in Fast Ignition

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One of the most crucial issues of fast ignition is efficient core heating by laser produced fast electron beam. The main factors in preventing efficient heating are (1) too high fast electron energy and (2) too large beam divergence. The fast electron energy could be controlled by eliminating pre-plasma generation and by using heating laser with shorter wavelength. With respect to the beam divergence, it is difficult to control the angular spread of fast electrons since laser-plasma interactions are the non-linear phenomena. To control the electron beam, we propose the beam guiding using self-generated and externally applied magnetic fields. In the present paper, we demonstrate (1) the suppression of the Weibel instability in the low density plasma close to the laser-plasma interaction region and (2) the sufficient beam guiding performance in the dense region (propagation region from interaction region to the core) by applying kT-class external magnetic fields on the basis of the numerical simulations. It is found that a sufficient enhancement of core heating efficiency is expected from the both effects.

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