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## A Pathway to Laser Fusion Energy: Fast Ignition Realization EXperiment (FIREX)

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Here we report recent progress of the fast ignition inertial confinement fusion demonstration. Fraction of low energy ( $< 1$  MeV) component of the relativistic electron beam (REB), which efficiently heats the fuel core, increases by the factor of 4 by enhancing pulse contrast of heating laser and removing preformed plasma sources. Kilo-tesla magnetic field is studied to guide the diverging REB to the fuel core. The transport simulation of the REB accelerated by the heating laser in the externally applied and compressed magnetic field indicates that the REB can be guided efficiently to the fuel core. The integrated simulation shows  $>4\%$  of the heating efficiency and  $> 4$  keV of ion temperature are achievable by using GEKKO-XII and LFEX, properly designed cone-fuel and the external magnetic field.

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