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IFE/1-3: Fast Ignition Integrated Experiments with Gekko-XII and LFEX Lasers

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Implosion and heating experiments of Fast Ignition (FI) targets for FIREX-1 project have been performed with Gekko-XII and LFEX lasers at the Institute of Laser Engineering, Osaka University. The goal of the project is to achieve fast heating of the imploded fuel plasma up to 5 keV by injection of the heating laser beam. After the first integrated experiments of Fast Ignition with LFEX laser in 2009, in which we concluded that the existence of the prepulse in the heating laser may have affected the heating efficiency by modifying the hot electron spectrum to unexpected higher energy range, we tried to significantly improve the pulse contrast of the LFEX laser beam. Also we have much improved the plasma diagnostics to be able to observe the plasma even in the hard x-ray harsh environment. In 2010-2011 experiment after the previous IAEA/FEC-23, a plastic (CD) shell target with a hollow gold cone was imploded with Gekko-XII laser. LFEX laser beams were injected into the cone at the time around the maximum implosion. We have successfully observed neutron enhancement up to 3.5×10^7 with total heating energy of 300 J, which is higher than the yield obtained in the experiment with previous heating laser, PW, in 2002. We found the estimated heating efficiency assuming a uniform temperature rise is at a level of 10-20 %. Fuel heating up to 5 keV is expected with full-spec output of LFEX.

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