Contribution ID: **576** Type: **Poster**

IFE/P6-11: Study on the Energy Transfer Efficiency in the Fast Ignition Experiment

Thursday, 11 October 2012 14:00 (4h 45m)

Accuracy of the energy transfer efficiency evaluation for fast ignition laser fusion at GEKKO XII and LFEX facility was improved to a great extent by newly developed x-ray spectrometer, time-resolving x-ray imager, and a fast-response gated neutron detector. Energy transfer efficiency from heating laser to hot electrons through an Au cone attached on a CD shell target was diagnosed from absolute yield measurement of Au K-alpha line with a newly developed Laue-type x-ray spectrometer to be 11-27 % on the assumption of hot electron temperatures derived by widely used scaling-laws.
Imploding shell dynamics, self-emission image, and electron temperature were measured with a multi-imaging x-ray streak camera. In some shots enhancement of the emission after heating were observed.
Relationship between the neutron yield and the heating time relative to the time of density peak diagnosed with multi imaging x-ray streak camera is compared. Significant increase in neutron yield was obtained only when the core is heated within ±25 ps of the maximum compression. This time-window is comparable to the retaining time of dense compression. This fact indicates the neutron enhancement was induced by fast heating. Maximum neutron yield in the present experiment was revealed to be 3.5×10ˆ7 in the shot with the 301 J heating, which was the highest value ever reported. In this shot, the energy transfer efficiency from laser to core plasma was estimated to be 10 -20 % with the assumption of typical density profile and uniform heating model. The ion temperatures for this shot and the shot without heating were estimated, by assuming the core having density profile previously reported was heated uniformly, to be 0.7 keV and 0.5 keV, respectively. This energy transfer efficiency successfully promises the core can be heated up to the 5 keV required for ignition with 10 kJ heating which is designed value of LFEX laser.

Country or International Organization of Primary Author

Japan

Primary author: Mr ARIKAWA, Yasunobu (Japan)

Co-authors: Prof. NISHIMURA, Hiroaki (Insititute of Laser Engineering Osaka University); Mr HOSODA, Hirokazu (Insititute of Laser Engineering Osaka University); Prof. AZECHI, Hiroshi (Insititute of Laser Engineering Osaka University); Prof. SHIRAGA, Hiroyuki (Institute of Laser Engineering, Osaka University); Dr KOGA, Mayuko (Insititute of Laser Engineering Osaka University); Prof. NAKAI, Mitsuo (Insititute of Laser Engineering Osaka University); Prof. SARUKURA, Nobuhiko (Insititute of Laser Engineering Osaka University); Dr FUJIOKA, Shinsuke (Insititute of Laser Engineering Osaka University); Mr TAKEHIRO, Sogo (Insititute of Laser Engineering Osaka University); Mr NAGAI, Takahiro (Insititute of Laser Engineering Osaka University); Dr JOHZAKI, Tomoyuki (Institute for Laser Technology); Mr ISHII, Yoshinori (Insititute of Laser Engineering Osaka University); Dr ZHANG, Zhe (Insititute of Laser Engineering Osaka University)

Presenter: Mr ARIKAWA, Yasunobu (Japan)

Session Classification: Poster: P6

Track Classification: IFE - Inertial Fusion Experiments and Theory