Development and Operation of Facility-Provided Plasma Diagnostics

Osamu Maegawa, Kyoko Shimada, Mayuko Koga, Takashi Fujiwara, Keiji Takarada and Hiroyuki Shiraga

INTRODUCTION

The PDT section used to be a group which consisted of technicians and engineers who support the GXII experiments in operation, maintenance and advising users on how to use facility-provided plasma diagnostic instruments and development of the experiment-supporting devices. As ILE has become a nationwide joint-use laboratory from 2006, the PDT section increased its support and research activities.

We have supported the experimental campaigns on Gekko-XII, FB-04, FC-01, FC-02, FC-03, FC-04. Simultaneously, we developed, improved and established new instruments and devices such as the bubble detectors, the new trigger system using the optical fibers, and a new plan of using X-ray framing cameras.

In this report, we describe the summary of those works.

2) Application of Bubble Detectors for FIREX neutron diagnostics.
3) Measurement of PW Laser Injection Time relative to Imploded Core Plasma by Using Framing Cameras.
4) Operation of “GXII Experimental Database”.

NEW TRIGGER SYSTEM USING OPTICAL FIBER

We designed and constructed a new triggering system supplying pulses about 400ms before the laser shot. In this system, an electrical pulse generated in the GXII operating room is converted to an optical pulse, and then transmitted by an optical fiber to GXII target room.

APPLICATION OF BUBBLE DETECTOR FOR FIREX

In the Fast Ignition Realization Experiment (FIREX), measurement of the primary and secondary neutron yield is one of the key diagnostics. However, gamma-ray background generated by an ultra-short pulse laser makes it difficult to measure the neutron yield with some of the neutron detectors such as plastic scintillators. We adopted a bubble neutron detector as a new promising gamma-insensitive detector and started to examine the feasibility of the detector using commercially available dosimeters provided from BTI inc. Details are described in this report. [1]

MEASUREMENT OF PW LASER INJECTION TIME RELATIVE TO IMPOLED CORE PLASMA BY USING X-RAY FRAMING CAMERA

Fast ignition scheme is one of proposed ways for laser fusion. This scheme separates the laser into two systems: one for implosion and the other for heating the imploped fuel core. For effective heating of the imploped core, it is necessarily to precisely control the injection time of the heating laser to the implosion laser. We are developing a method by using an X-ray framing camera for simultaneous measurement of x-rays generated from the imploped core plasma and from the interaction region of ultra-intense PW laser which indicates injection time of the heating laser. Details are described in this report. [2]

OPERATION OF “GXII EXPERIMENTAL DATABASE”

Our previous “GXII Experimental Database” system was designed mainly for internal use only. On the web page one can access to “Daily Schedule”, shot parameters, image data, laser waveform data, etc, by using internal network. Since ILE has become a nationwide joint-use facility, we have developed a similar system for joint-use collaborators to handle each experimental data with high secure authentication.

REFERENCES