§2. New Apparatus for Fuel Layering Demonstration of FIREX Target

Iwamoto, A., Sakagami, H.,
Nakai, M., Norimatsu, T., Shiraga, H., Azechi, H.
(ILE, Osaka Univ.)

The fuel layering for a Fast Ignition Realization EXperiment (FIREX) target has been studied under the collaboration between the Institute of Laser Engineering (ILE), Osaka University and the National Institute for Fusion Science (NIFS). The target to create ~50 million degree fusion plasma consists of a 500 μm plastic shell, a cone guide and a fill tube (see Fig.1). The final goal is to form a solid DT or D_2 fuel layer with ~20μm in thickness on the inner surface of the plastic shell. To date, a preliminary demonstration to create a thin H_2 ice layer on the inner surface of a 2 mm Polystyrene (PS) shell was succeeded using a dedicated apparatus.[1)] The study is going to move the detailed optical observation stage. However, the apparatus is not well-designed for optical measurements. Therefore, a new apparatus designed especially for optical observations has been built.

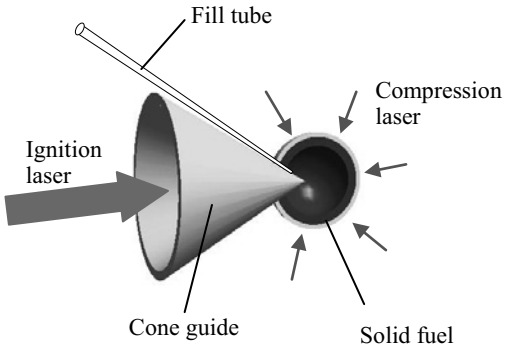

Fig. 1. Typical FIREX target.

The specifications of the new apparatus are shown as the followings:

1. Easy removing of a sample by a novel vacuum seal system,
2. Glass windows with wide aperture for direct optical observation,
3. 360 degree target rotatable mechanism of sample holder,
4. Active and passive vibration control systems to prevent the vibration from a cryocooler and environment,
5. Minimum temperature is less than 10 K for H_2 solidification.

The illustration of the dedicated apparatus is shown in Fig. 2.

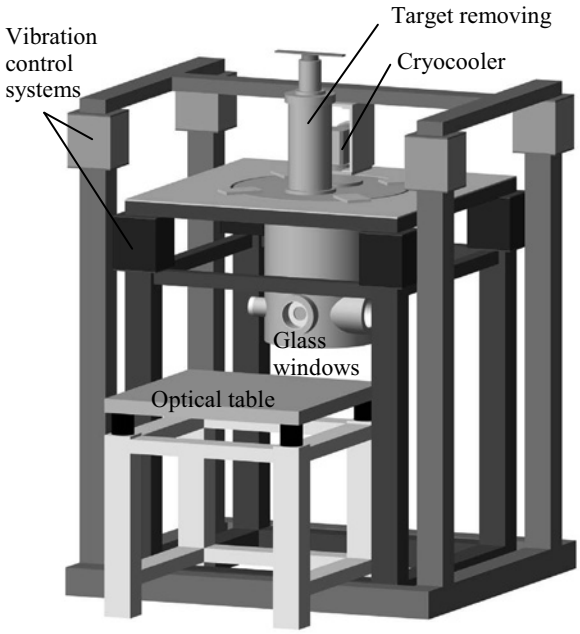

Fig. 2. New dedicated apparatus for fuel layering demonstration for FIREX.

Fig.3 shows the novel seal system for easy target removing. Leak tightness is proven by a metal o-ring whose load is confirmed by a load cell. A target is cooled by low pressure gaseous He (GHe).

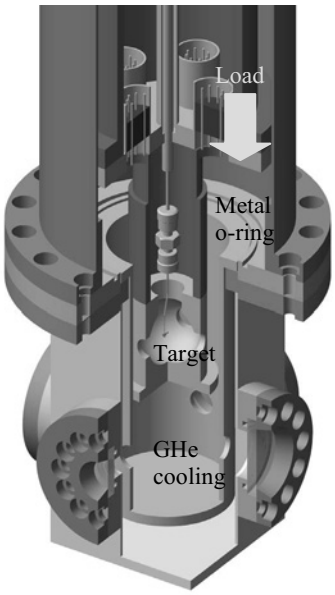

Fig. 3. Novel seal system for easy target removing.

The minimum temperature of 8.5 K and a cryogenic leak tightness of the target chamber were confirmed in the first cool-down.

1) Iwamoto, A., et al.: J. Phys.: Conf. Ser. **244** (2010) 032039.