Key technology for the laser-fusion power plant.
Succeeded in 10 Hz repetition injection of fuel pellets.
One-step advance to realize a small-scale fusion reactor.

June 4, 2019

The Graduate School for the Creation of New Photonics Industries
President Yoshihiro Takiguchi, Professor

Our school has developed a new fuel pellet injector for the laser fusion reactor. The new one injects now 10 pellets in 1 second for more than 20 minutes duration. 6 years ago, we had for the first time developed a 1 Hz injector, but the fusion power plant requires 10 Hz repetition rate operation.

The principle of the laser fusion is that multi beams of strong pulse laser implode a DD or DT fuel pellet to foam a dense and high temperature core, which is similar to the central core of the Sun. But this state is no more kept than a few tens ps, within which duration DD or DT nuclear reaction occurs to bring us a huge energy.

The power plant requires not 1 Hz, but 10 Hz or more operation to produce the energy sufficient for electric power output.

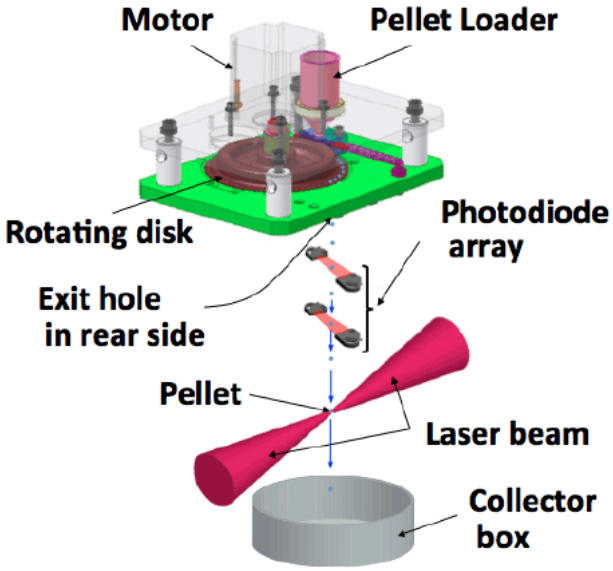

Figure 1. Fuel injector. Fuel pellets stored in "Pellet Loader" are distributed into 200 holes on the periphery of "Rotating disk", from

which fuel pellets are injected at 10 Hz to "Laser beam" engagement position. Then two counter "Laser beams" hit the pellet at 10 Hz.

Figure 1 shows the fuel pellet injector. The rotation disk is the most important part. Previous rotating disk has only 20 holes to inject one pellet in a second. This time a new rotating disk has 200 holes to distribute and inject 10 pellets in a second.

This result is to be presented to TARG4 the 4th Targetry for high Repetition Rate Laser-Driven Sources Workshop on June 10 to 12 in Milano, Italy.

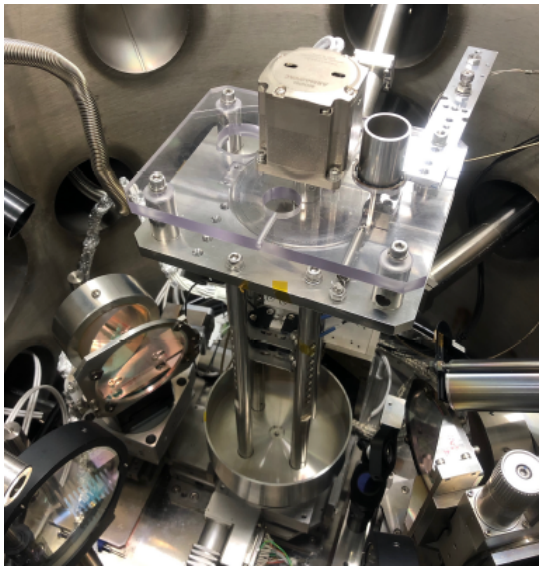

Figure 2. 10 Hz injector Installed in illumination chamber

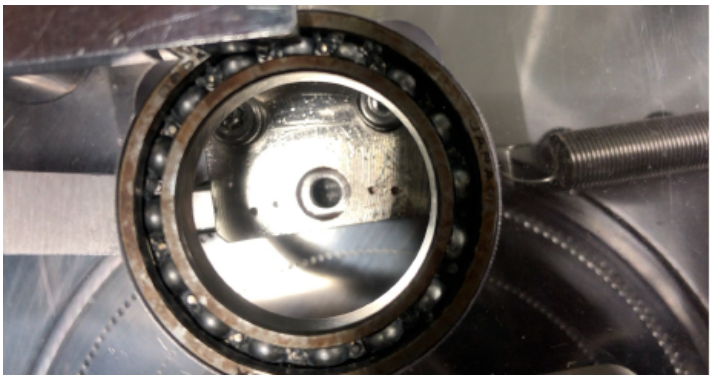

Figure 3. 200 holes on the periphery of Rotating Disk.

Collaborating with Central Research Laboratory, Hamamatsu Photonics K.K., Advanced Material Engineering Division, Toyota Motor Corporation, Nagoya University GREMO, Aichi SR Center, Purdue University, ILE, Osaka University, National Institute of Advanced Industrial Science and Technology, National Institute for Fusion Science, and Hiroshima University, Engineering Faculty.

Inquiry to Yoneyoshi Kitagawa, Prof.
Phone 053-484-2510, 080-5321-8729,
kitagawa@gpi.ac.jp