

Progresses of inertial fusion energy program at GPI Hamamatsu toward mini-reactor CANDY

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- A mini-reactor CANDY [1,2] that based on kJ-class diode-pumped solid-state laser (DPSSL) is proposed to perform feasibility studies of the power plant in fast ignition scheme fusion.

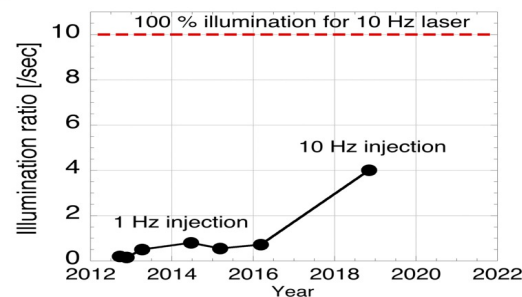
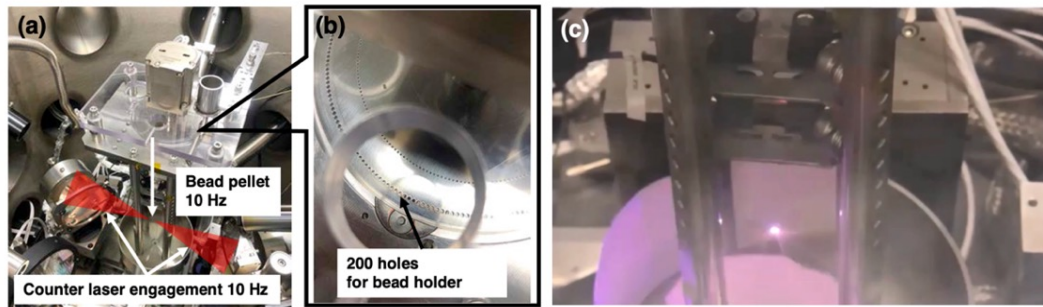
Progress 1: Pellet injection & engagement

- The 10 Hz operation, the same frequency with laser repetition, is achieved beyond 2 min. with illumination shot ratio of 40% per sec; 5 times improvement from the previous 1 Hz operation[3,4].

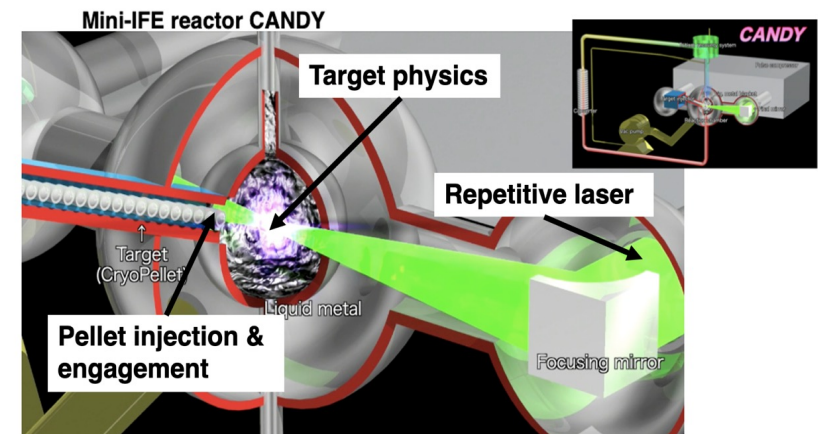
Progress 2: Target Physics [Kitagawa ID:784 /Ozaki ID:834]

- LFEX laser with energy/pulse duration of 0.3-0.9 kJ/1.5-2 ps was successfully illuminated into the counter-imploded core of density 3 g/cc, ion temperature of $T_i \sim 0.7-0.9$ keV along axis or transverse of the imploding laser bundle.

ϕ 1mm CD beads 10 Hz injection system engaged by 10 Hz 3 TW laser



Laser-driven Inertial Fusion Energy (IFE) Reactor



[1] MORI, Y. "Laser Fusion CANDY GPI/Hamamatsu", Commercializing Fusion Energy: How Small Businesses are Transforming Big Science, IOP Publishing Ltd., London (2021).

[2] KITAGAWA, Y. et al., Progress toward a unified kJ-machine CANDY, J. Phys. Conf. ser. 688 (2016) 012049.

[3] KOMEDA, O. et al., First demonstration of laser engagement of 1-Hz-injected flying pellets and neutron generation, Sci. Reports 3 (2013) 2561.

[4] MORI, Y. et al., 1-Hz bead-pellet injection system for fusion reaction engaged by a laser HAMA using ultra-intense counter beams, Fusion Sci. & Technol. 75 (2019) 36.