Fast ignition fusion by counter beam illumination for the CANDY project -Hole boring on injected CD spherical pellet targets-

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A kJ-class mini reactor CANDY, as in Fig. 1, is proposed for an engineering feasibility study of the power plant in the counter beam fast ignition scheme fusion. To develop the CANDY, we are performing fast ignition experiments using both single-shot petawatt lasers[1] and a high-repetition-rate laser-diode(LD)-pumped laser with counter beam configuration[2].

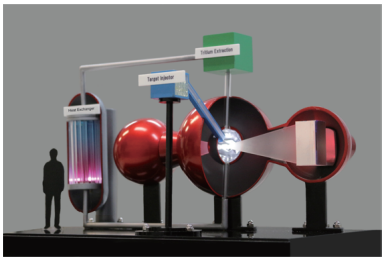

Figure 1: *CANDY image. DT cryogenic fuel pellets are injected at 10 Hz by the counter implosion beams followed by coaxial heating beams.*

Fuel pellet injection and repetitive laser illumination are key technologies for realising inertial fusion energy[3]. Relating to the fast ignition fusion, hot electron transports through a dense core are big issues. We have succeeded in 1 Hz injection of solid spherical deuterated polystyrene bead pellets, whose diameter is 1mm, which two ultra-intense laser beams engaged from both sides. A straight channel (hole boring) with about 10μm diameter was formed inside the injected pellets, as in Fig. 2. The laser provides 0.63 J/beam in 100 fs at 811 nm: 4.7×10^{18} W/cm^2. Only the injected pellets have the holes, but no other shaped or earthed targets have. The experiments show that the short pulse laser driven hot electrons bore the holes. Some possible mechanism due to such as preplasmas will be presented.

Figure 2: *Hole through in an injected and counter-laser beam engaged CD bead.*

References

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