

(TG1) Multi-ion group report



Nov. 2, 2021 (H. Kasahara)

Date: Nov. 2, 2021

Time: 9:40 - 13:15, 16:31 – 18:45

Shot#: 171546 – 171605(60 shots), 171637 – 171678 (42 shots)

Prior wall conditioning: D-Glow

Divertor pump: On (except for 2-I)

Gas puff: D2, Pellet: Ti, Al, C

LID: No

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, D, D)=P(4.1, 5.0, 4.1, 5.5, 6.5)MW

ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.70, 0.79)MW

ECH(154GHz)=ant(2-OLL, 2-OUL, 2O-LR)=P(0.72, 0.72, 0.73)MW

ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(0, 0, 0, 0) MW

Neutron yield integrated over the experiment = 5.5×10^{15} , 1.4×10^{16}

Topics

1. Accumulation of confinement data in the case of significant ion heating(H. Yamada)
2. Z-dependence of transport characteristics of the high-Ti plasmas (M. Goto)

Accumulation of confinement data in the case of significant ion heating (H.Yamada et al.)

Background and objective

- Compilation of confinement database has been enriched, in particular, for investigation of isotope effect.
- Nonetheless, the case with perpendicular NBI heating was shortfall in the database.
- Fulfilling data with significant ion heating is inevitable for further comprehensive study of isotope effect.

Experimental Condition

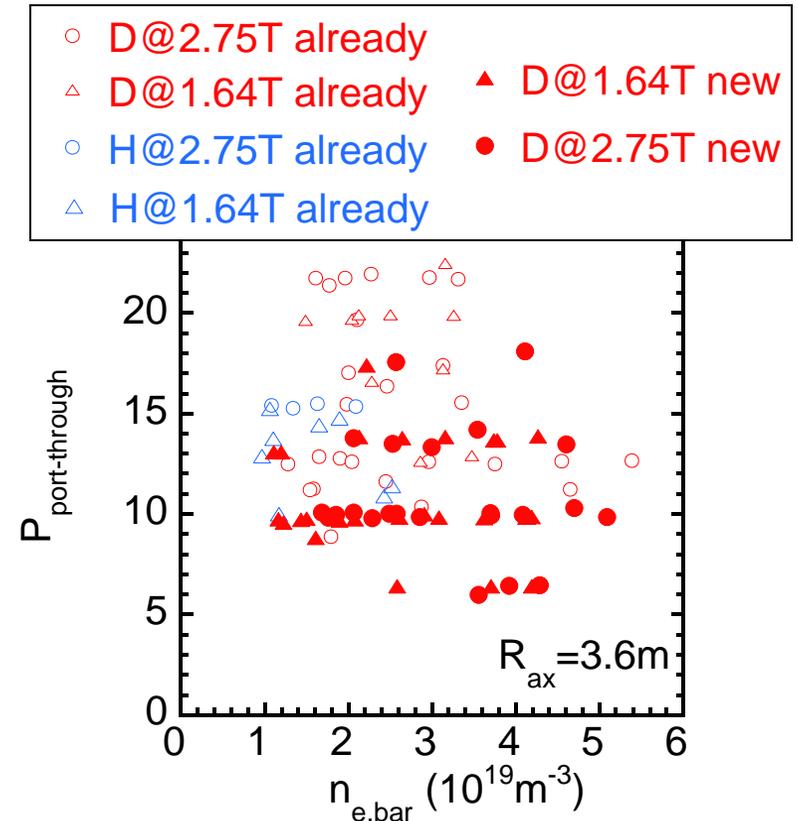
- $R_{ax}=3.6\text{m}$, $B=1.64/2.75\text{T}$ ($M^{3/4}$), Scanned density and power under the condition with NBI#4 injection
- Purity of D as high as 90% is secured.

Results

- Significant extension of database in the case with perpendicular NBI heating.
- D at 2.75T: 26 cases \rightarrow 49 cases, at 1.64T: 10 cases \rightarrow 36 cases

Scope

- These **D data** are to be paired with the **H data** from the experiment on Feb. 3rd in 2022.
- Revisit to the scaling law of energy confinement time and dimensionally similar comparison of thermal transport including the case with significant ion heating.



High- T_i plasma characteristics with different impurity pellets

Experimental conditions:

$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.6 \text{ m}, \text{CCW}, 2.75 \text{ T}, 1.2538, 100.0\%)$

Objective and method:

- Dependence of high- T_i plasma characteristics on different impurity pellet materials is investigated.
- Carbon pellets including Al and Ti are injected and resulting T_i profiles are compared with pure carbon pellet case (Fig. 1).

Results:

- No clear difference is observed among C, Al, and Ti pellets, but highest T_i is slightly delayed in the Al pellet case (Fig. 2).
- The C pellet gives slightly higher T_i profile in the entire radial locations than other pellet cases when compared at the highest T_i timing (Fig.3).
- Detailed impurity density profiles will be investigated with spectroscopic data.

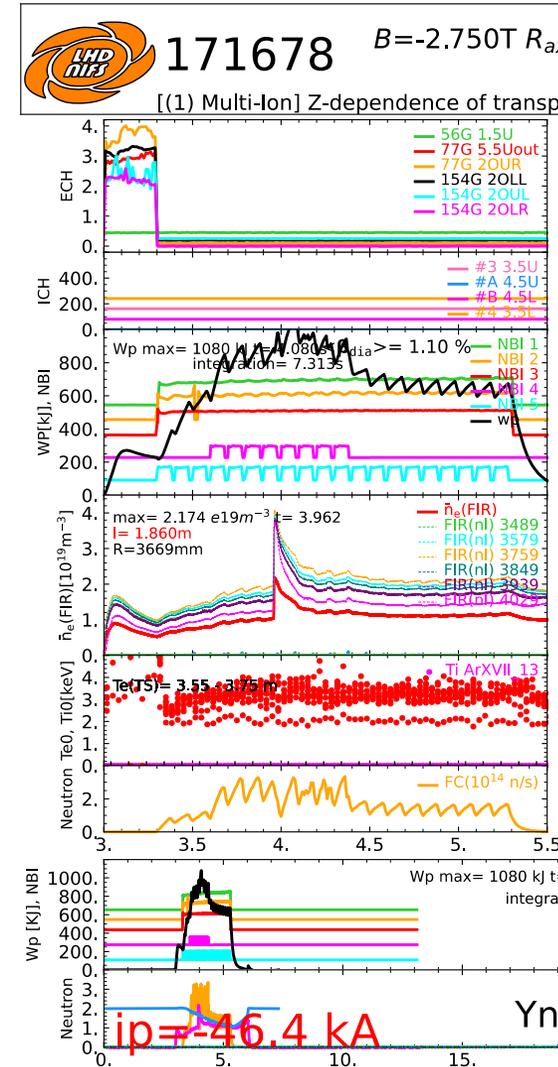


Fig. 1

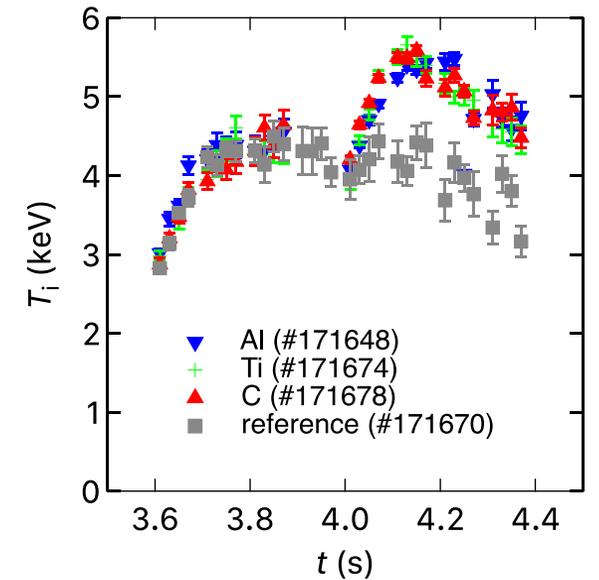


Fig. 2

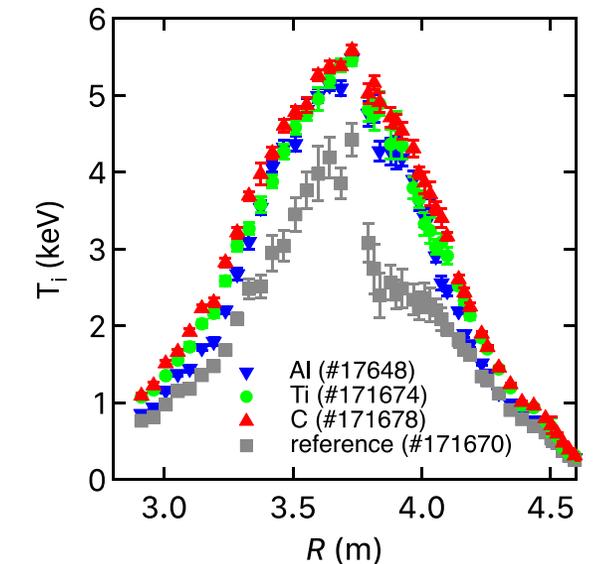


Fig. 3