

(TG1) Multi-ion group report



Date: Jan. 25, 2022

Jan. 26, 2022 (G. Motojima)

Time: 9:50-13:25, 17:00-18:45

Shot#: 177068–177128 (61 shots), 177194-177227 (34 shots)

Prior wall conditioning: H2 glow

Divertor pump: Yes

Gas puff: H₂, He, Ar

Pellet: C Pellet

NBI#(1, 2, 3, 4, 5) = gas(H, H, H, H, H) = P(4.6, 4.1, 4.2, 3.9, 4.6) MW

ECH(77 GHz) = ant(5.5-Uout, 2-OUR) = P(448/703, 559/792) kW

ECH(154 GHz) = ant(2-OLL, 2-OUL, 2-OLR) = P(463/723, 484/799, 482/825) kW

ECH(56 GHz) = ant(1.5U) = P(-) kW

ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(0.33/0.42, 0.33/0.42, 0.39/0.5, 0.23/0.24) MW

Neutron yield integrated over the experiment = 5.8×10^{12} (total)

Topics

1. Configuration dependence of the core impurity transport and impurity hole is investigated. (S. Satake, J.L. Velasco)
2. Harmonics cyclotron wave excitation through particle-wave interaction process during high ICRF heating (H. Kasahara)

LHD experiment summary 2022/1/25 impurity-hole experiment

J. L. Velasco(CIEMAT), S.Satake

- Main subject

Measure E_r profile in impurity hole plasma by HIBP and examine the impurity hole phenomenon on the R_{ax} and NBI torque, and analyze the impurity neoclassical / turbulent transport.

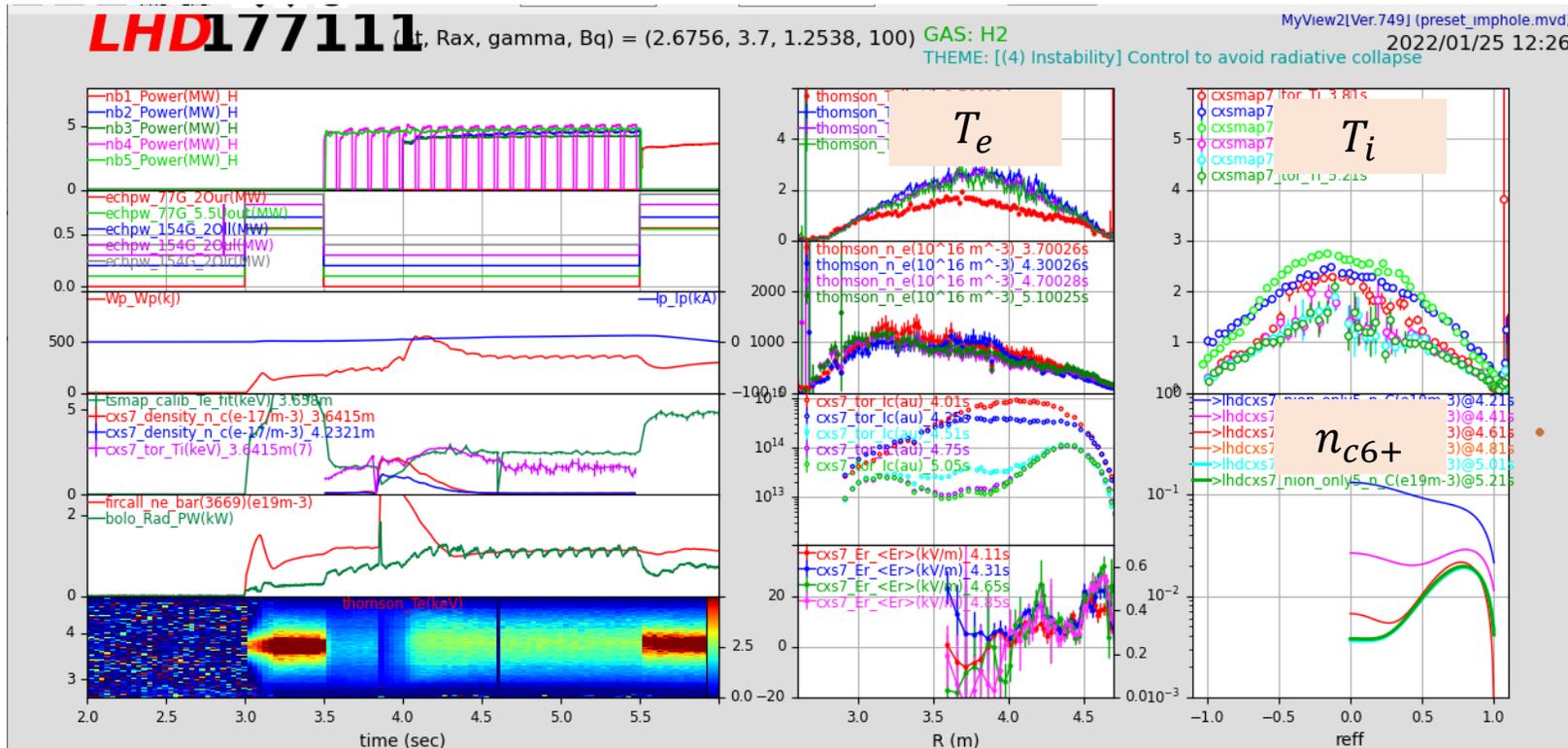
- Results

- $n_e \approx 1.0e19$ low density shots with impurity hole were constantly observed for $R_{ax} = 3.65$ and 3.70 . Low- n_e is the key point to measure E_r near the magnetic axis.

- $T_{i0} \approx 2.5 - 3.0\text{keV}$ ($\approx T_{e0}$), not so high-Ti as intended, but impurity hole appeared.

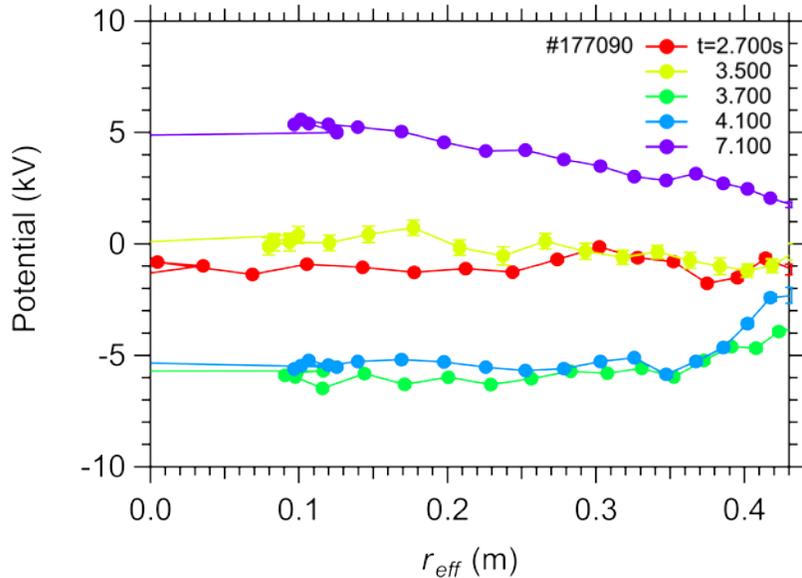
- For $R_{ax} = 3.55$, $T_{i0} < 2.0$ and impurity hole was not observed.

- Succeeded to carry out the balance-, co-, and counter-NBI torque input cases as planned.

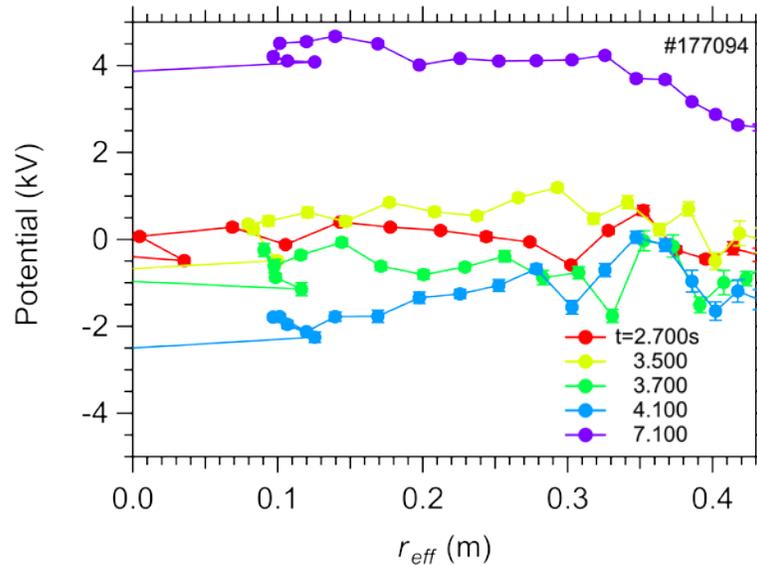


HIBP measurement was successful for all $R_{ax} = 3.55, 3.65, \text{ and } 3.70$ cases.

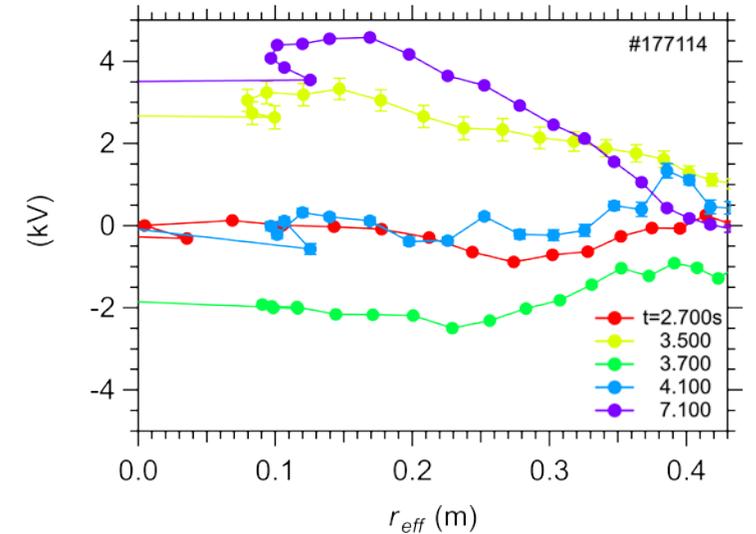
$R_{ax}=3.55\text{m}, B_t=2.7887\text{T}$



$R_{ax}=3.65\text{m}, B_t=2.7123\text{T}$



$R_{ax}=3.7\text{m}, B_t=2.6756\text{T}$



As in the previous impurity-hole plasma of $R_{ax} = 3.60\text{m}$ configuration, Er in the core region seems to be positive before pellet injection and changed to negative during the impurity hole was growing up. Negative-Er but outward C^{6+} flux are expected from recent neoclassical simulation.

Harmonics cyclotron wave excitation through particle-wave interaction process during high ICRF heating (H. Kasahara)

Magnetic Configuration: (R_{ax} , Polarity, B_{ax} , γ , B_q) = (3.60 m, CW, 2.75 T, 1.2538, 100.0%)
Shots: #177194 ~ #177227 (34 shots)

Goal of this experiment

Observation for velocity deformation process by acceleration during ICRF heating

Main results of this experiment

- Variation of velocity distribution function (5, 10, 25, 50Hz) for four different ICH modulation frequencies using CXS with the pNBI modulation (180ms/20ms) in two kinds of density levels (1×10^{19} , $0.7 \times 10^{19} \text{ m}^{-3}$).
- Hydrogen concentration was too high for He(H) operation, and the fast ion tail was weak.
- In order to confirm the deformed velocity distribution, analysis for perpendicular velocity spectrum measured CXS will be performed.

