Date: Jan. 25, 2022
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 Er profile in impurity hole plasma by HIBP and examine the impurity hole phenomenon on the Rax and NBI torque, and analyze the impurity neoclassical / turbulent transport.

- Results
  \[ n_e \approx 1.0 \times 10^{19} \] 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.

  - \( T_{io} \approx 2.5 - 3.0 \text{keV} \ (\approx T_e 0) \), not so high-Ti as intended, but impurity hole appeared.

  - For \( R_{ax} = 3.55 \), \( T_{io} < 2.0 \) 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.

As in the previous impurity-hole plasma of $R_{ax} = 3.60m$ 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: \((R_{ax}, \text{Polarity, } B_{ax}, \gamma, B_q) = (3.60 \text{ m, CW, 2.75 T, 1.2538, 100.0\%})\)

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\((1\times10^{19}, 0.7\times10^{19} \text{ m}^{-3})\).
- 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.