(SG2, TC) Session Report

April 3, 2024 (M.Yoshinuma)

Date: April 2, 2024
Time: 10:30 – 16:45
Shot#: 188625 – 188747 (123 shots)
Prior wall conditioning: None
Divertor pump: On
Gas puff: H_2, Ar
Pellet: Carbon pellet

NBI#(1, 2, 3, 4, 5) = gas(H, H, H, H, H)=P(2.4, 2.4, 2.3, 3.8, 5.4) MW
ECH(77GHz) = ant(1.5-Uo, 5.5-U, 2-OUR)=P(0.44, 0.38, 0.7) MW
ECH(154GHz) = ant(2-OLL, 2-OUL, 2-OLR)=P(0.8, 0.98, -) MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -) MW

Topics

1. Core and edge turbulence in modulated ECH(M.Nishiura)
2. Turbulence characteristics in density-peaking plasma in LHD (R.Yanai)
3. Comparison of turbulence driven transport between LHD and W7-X (H.Sakai)

Core and edge turbulence in modulated ECH

M. Nishiura, R. Yanai, A. Shimizu, et al.

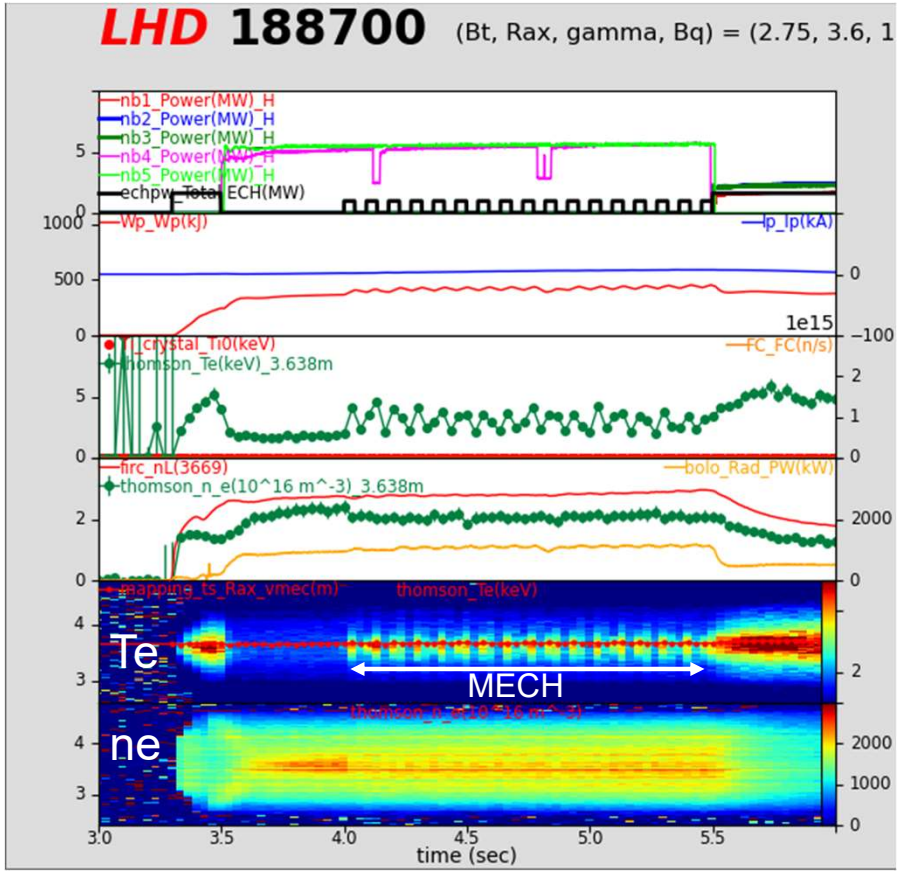
LHD experiment summary on 2 April 2024

<u>Purpose</u>

The feature of density peaking on energetic ion anisotropy is evaluated by using an EC heating to change a neoclassical / turbulence transport.

<u>Result</u>

- The density peaking is observed at $1x10^{19}m^{-3}$, $1.5x10^{19}m^{-3}$, and $2x10^{19}m^{-3}$. When the density is increased, the peaking becomes large.
- Modulated ECH(MECH) is applied at r/a=0, 0.5, and 0.9 to the density peaked plasmas to analyze a heat and particle transport. The heat transport is analyzed by Yanai. The particle transport is evaluated by MECH to change in the peaked density profiles.
- HIBP measures the electric potential.
- Doppler back scattering (DBS) will be analyzed.
- The modeling of this situation will be validated by FORTEC-3D and GKV.



Turbulence characteristics in density-peaking plasma in LHD (R. Yanai et al.)

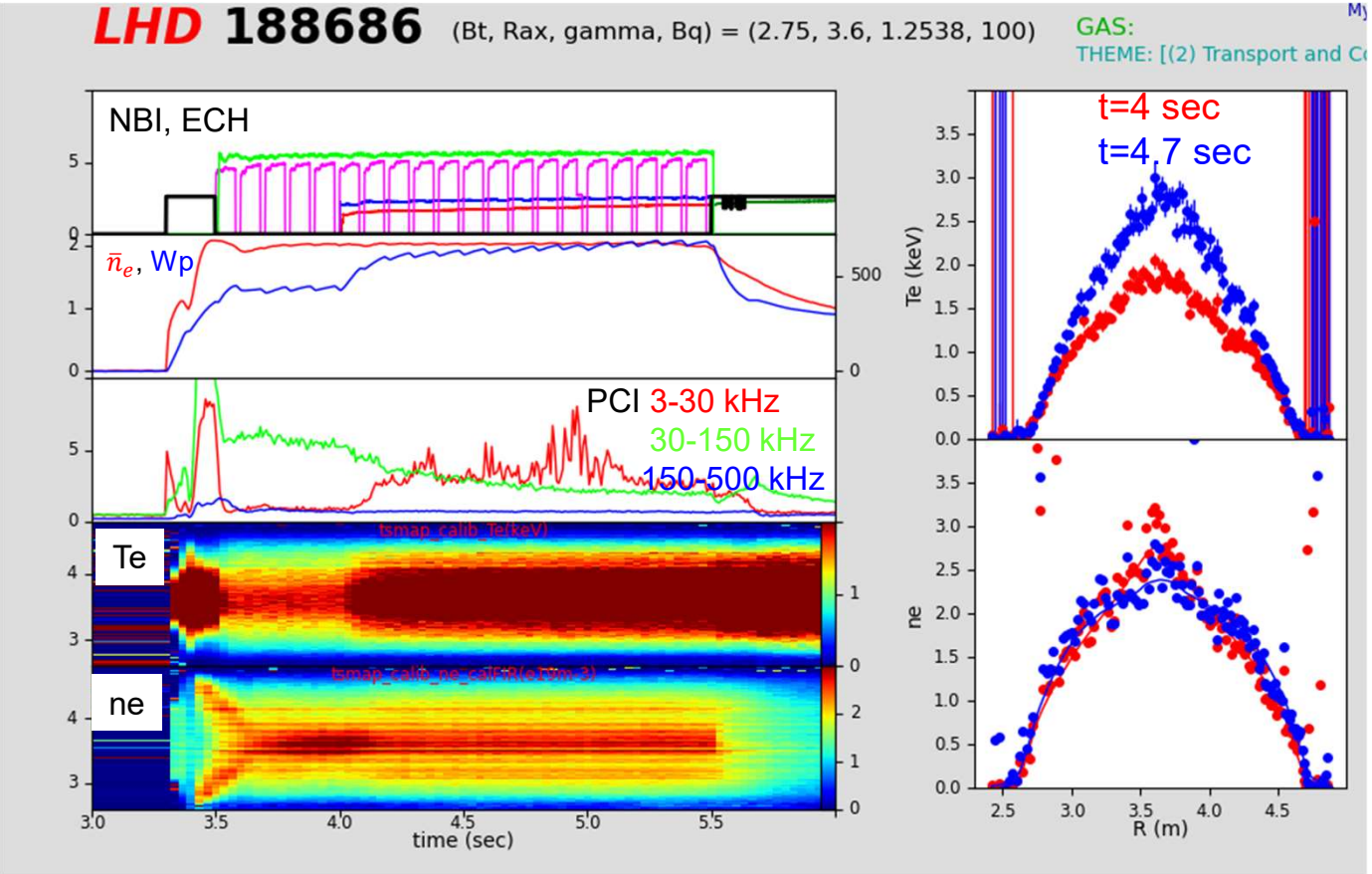
Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CW, 2.75 T, 1.2538, 100.0%)

Goal of this experiment:

- Investigating the characteristics of turbulence in density-peaking plasma in LHD.

Results:

- Density peaking plasma was sustained by perpendicular NBIs and tangential NBIs were injected from 4 sec.
- By tangential NBIs, Te increased, and density peaking slightly decreased.
- In PCI data, the density fluctuations in 30-150 kHz decreased, and that in 3-30 kHz increased by injecting tangential NBIs.
- BS data was also measured and will be analyzed.



Comparison of turbulence driven transport between LHD and W7-X (H-case)

H. Sakai (Kyushu Univ.), K. Tanaka

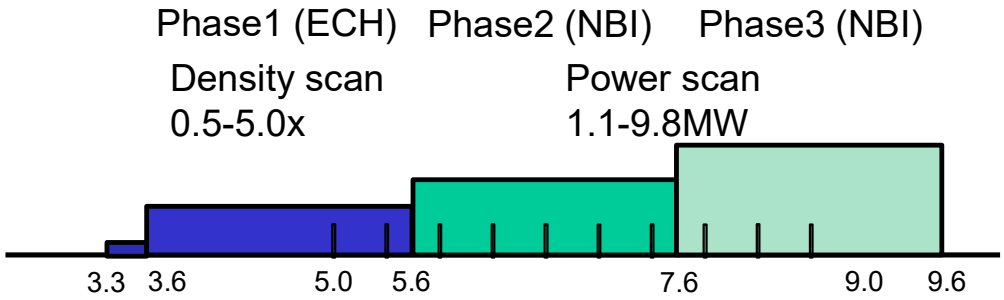
Shot No: #188713~188747 (35 shots)

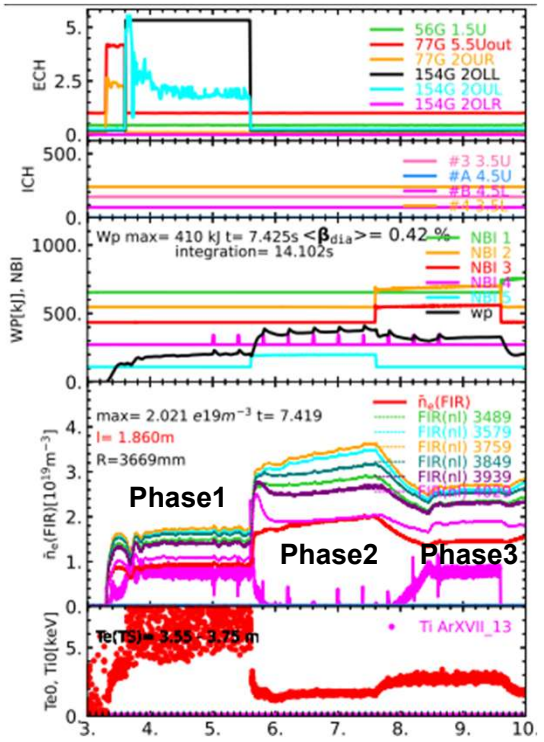
Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100 %)

Gas-puff: H_2

Approach

To clarify more detail difference in the picture of turbulence driven transport in LHD and W7-X, electron density scan was performed as flat-top with ECH (2,3MW). In addition, to understand more detail for Ti stiffness in LHD, NB power scan was also performed with flat-top fixed density (aimed to 1.5x). Latter was optional experiment.





Results

- ✓ On ECH phase, good flat-top plasmas were obtained. While this timing, sweeping detector PCI (which was developed for W7-X) was running, which enables to compare the results from same measurement method.
- ✓ On NBI phase, the experiment was partially successful. Unfortunately, flat-top density could not be obtained especially with BL5. However, time evolution of ion-scale turbulence should be obtained because conventional 2D-PCI was working. Therefore, we will choice suitable timing for evaluating Ti stiffness.