Daily report for 2025-11-14

T. Kobayashi

Date: November 14, 2025
Time: 10:00 – 18:45
Shot#: 196906 - 197068 (163 shots)
Prior wall conditioning: No
Divertor pump: Yes
Gas puff: H_2
Pellet: Ice pellet, C-pellet

NBI: #1, #2, #3, #4, #5)
ECH: 2-OUR (77GHz), 5.5-UO (77GHz), 2-OUL (154GHz)
ICH: No

Topics

1. Cyclic occurrence of thermal instability (R. T. Ishikawa)
2. CDC Stabilization Conditions (Y. Takemura)
3. Measurement of Plasma Dynamics during Core Density Collapse (CDC) in LHD (D. Den Hartog)
4. Driving Mechanism of Pellet-Triggered m/n = 2/1 Magnetic Islands (Y. Takemura)

Cyclic occurrence of thermal instability

R.T. Ishikawa, Masahiro Kobayashi,
Masato I.N. Kobayashi, & K. Nagaoka

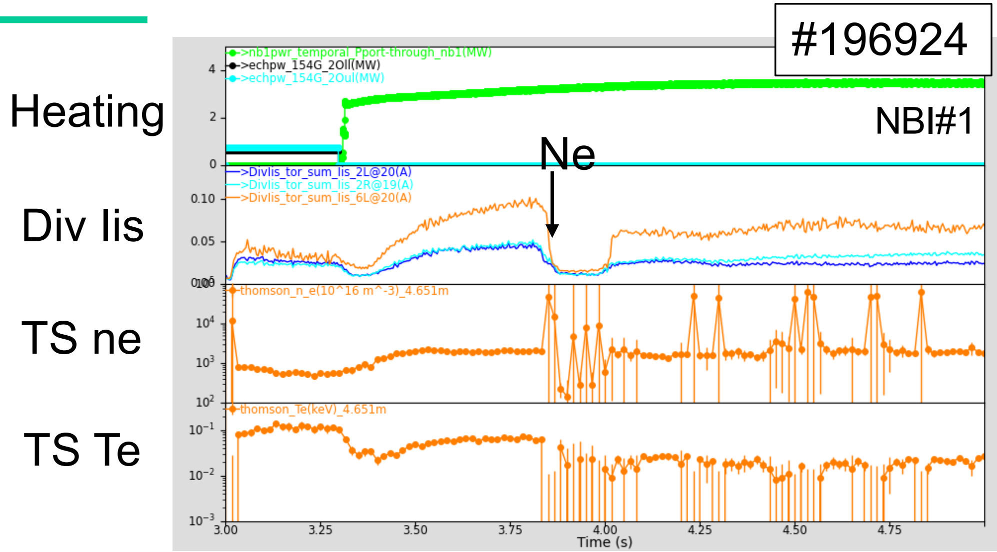
Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.9 m, CCW, 2.5385 T, 1.2538, 100.0%)
#196909 - #196947

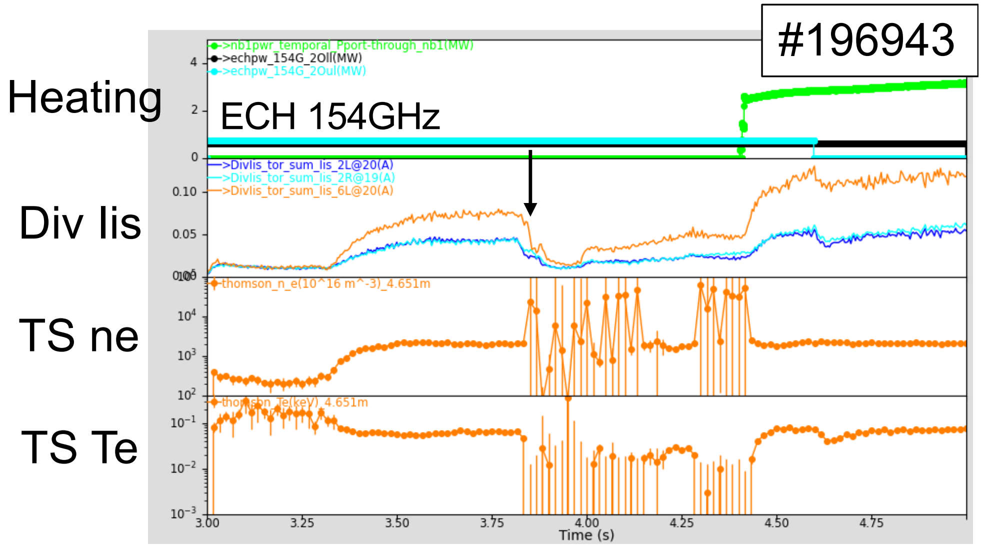
Motivation and method:

- Thermal Instability sometimes occurs repeatedly in LHD plasma, but the underlying mechanism remains unclear.
- We used Ne gas puff and LID current to realize the detachment state (ref: 181350).

Results:

- We observed signatures of cyclic thermal instability for different amounts of impurity gas and heating powers, although further careful analysis is needed.
- Fast Thomson scattering measurements also worked.





Y. Takemura

CDC Stabilization Conditions

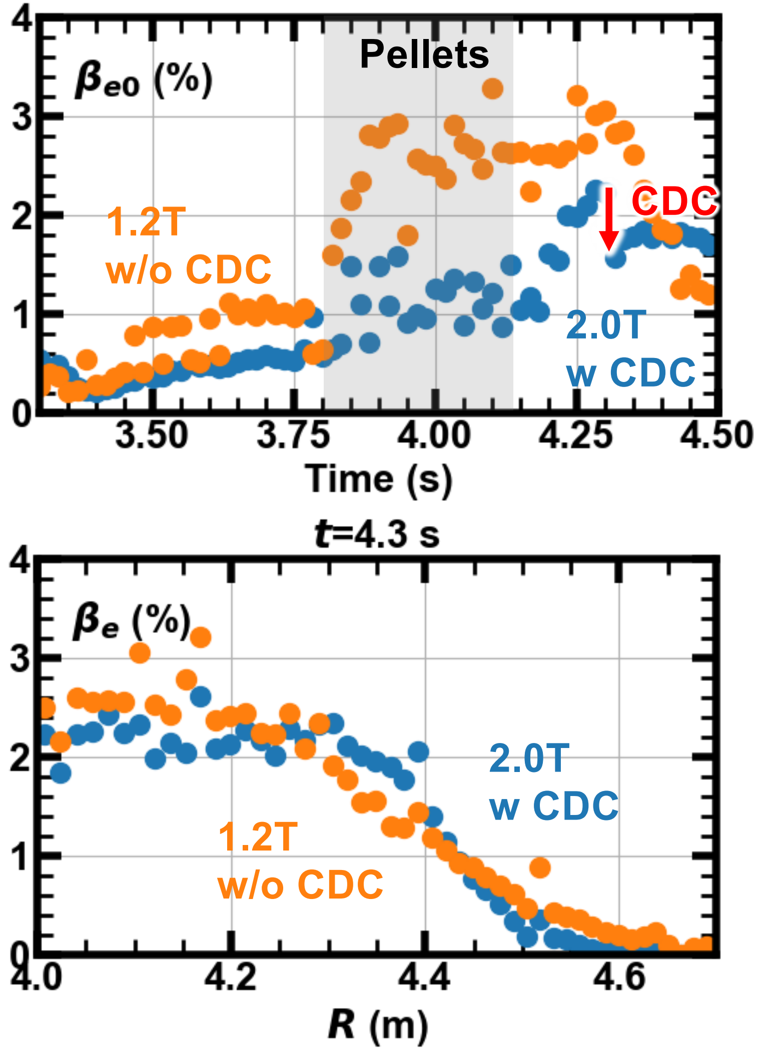
Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CCW, 2.0/1.2 T, 1.2538, 100.0%)
#196948–#197008, RMP for error field cancellation

Motivation and method:

- Previous studies[Ohachi+NF2017] have shown that under low B_t conditions, the central beta onset of CDC tends to increase
- A possible reason is that the edge pressure profile is lower at low magnetic field, which drives edge ballooning modes
- A B_t scan and a density scan using gas puffing before pellet injection were performed

Results:

- At 1.2 T, CDCs were hardly observed, which is consistent with earlier research, despite the fact that β_0 was higher than in the 2.0 T case
- In discharges with CDC, the pressure profile becomes steeper on the low-field side



Measurement of Plasma Dynamics during Core Density Collapse (CDC) in LHD

D. Den Hartog (U. Wisconsin), N. Kenmochi, Y. Takemura, Y. Suzuki (Hiroshima U.), A. Wright (U. Wisconsin), R. Sassella (U. Wisconsin), et al

Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.85 m, CCW, -1.2 T, 1.2538, 100.0%)
#197009 - #197038

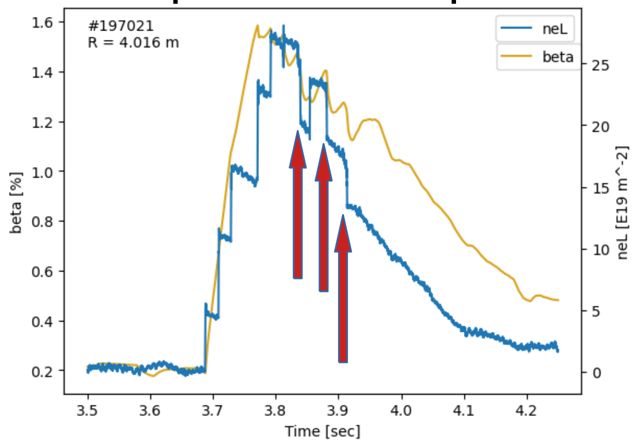
Motivation and method:

- CDC causes beta loss in super dense core plasmas
- Goal measurements:
  - high resolution measurement of ne, Te during CDC with 20 kHz Thomson system
  - Ti measurement during CDC with fast CXS and impurity injection to improve signal

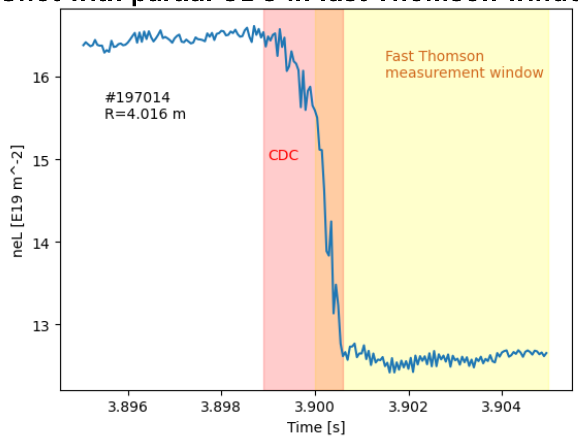
Results:

- CDCs produced for 23 of 30 shots—often multiple CDCs in one shot
- Partial fast Thomson data was obtained for at least one CDC
- With methane injection, a good CXS signal was obtained for several CDC shots: analysis to come

Example shot with multiple CDCs



Shot with partial CDC in fast Thomson window



Driving Mechanism of Pellet-Triggered m/n = 2/1 Magnetic Islands

Y. Takemura

Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.7 m, CCW, 1.0/1.375 T, 1.2538, 100.0%)
#197040–#197068, RMP for error field cancellation

Motivation and method:

- Observe m/n = 2/1 magnetic island form following H2 pellet injection
- Identifying the MHD instability requires the current (rotational transform) profile

→ MSE measurement

- Previous studies observed the phenomenon at 1 T. Because measurements of MSE are generally easier at slightly higher B_t, experiments were therefore also conducted at 1.375 T.

Results:

- MSE data were obtained in both B_t cases
- At 1.375 T, no distinct modes were observed