

Daily Report for 2025-11-05

M. Kobayashi

Date: November 5, 2025

Time: 10:10 -17:15

Shot#: 196060 – 196200 (141 shots)

Prior wall conditioning: No

Divertor pump: On

Gas puff: H₂, Ar

IPD: No

LID: No

NBI: #1, #2, #3, #4, #5

ECH: 5.5-UO (77GHz), 2-OUR (77GHz), 2-OUL (154GHz), 2-OLL (154GHz)

ICH:

Topics

1. Digital Twin-Based Advanced Control of LHD Plasma by ASTI (Y. Morishita, N. Kenmochi)
2. Investigation of ion heat transport in ITG-dominant Ti-ITB plasmas (F. Kin, T. Kobayashi)
3. Trial of high-Z metal impurity pumpout by ICRF three-ion heating (N. Pablant, M. Goto)

Shot #: 196060-196105

Experimental conditions:

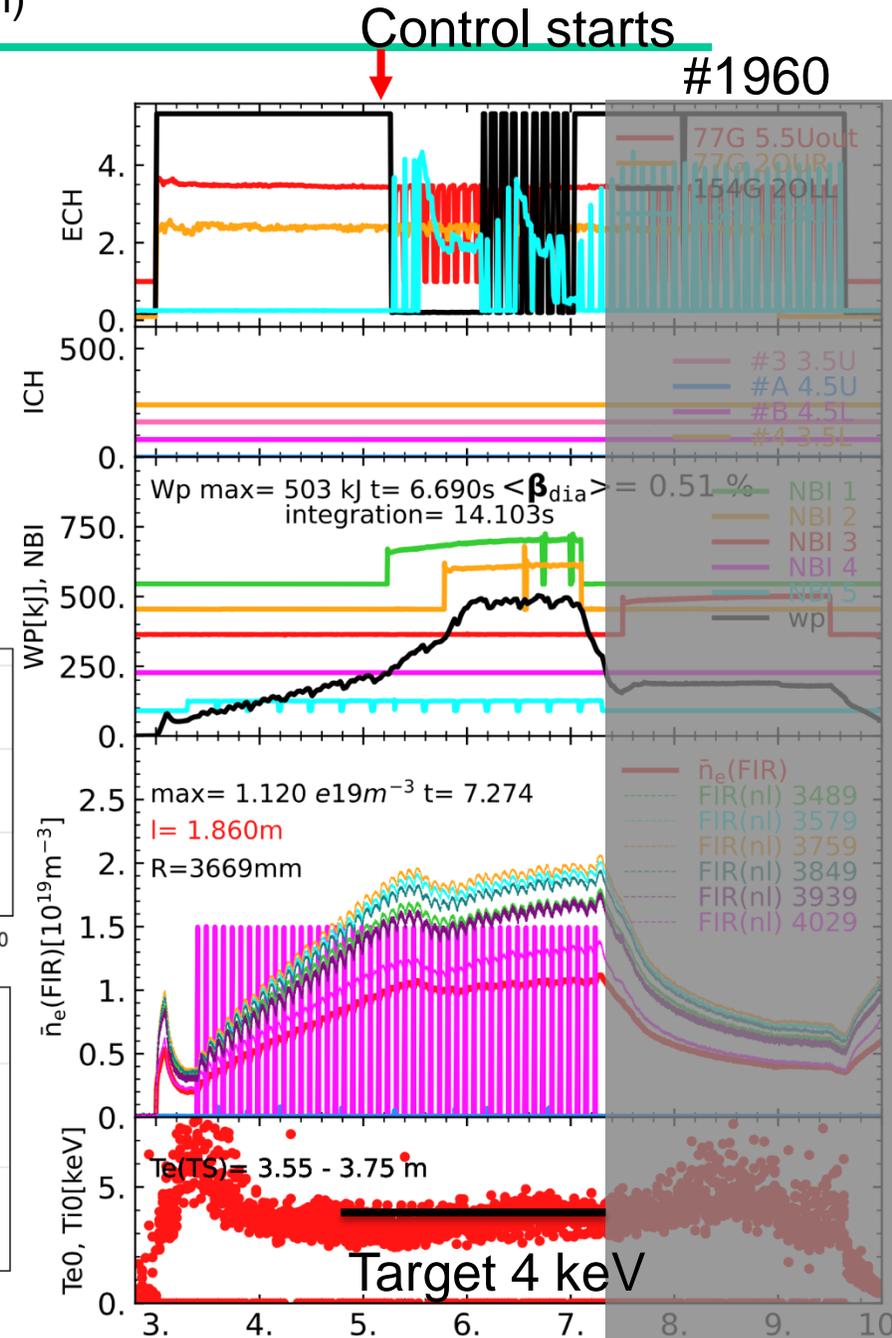
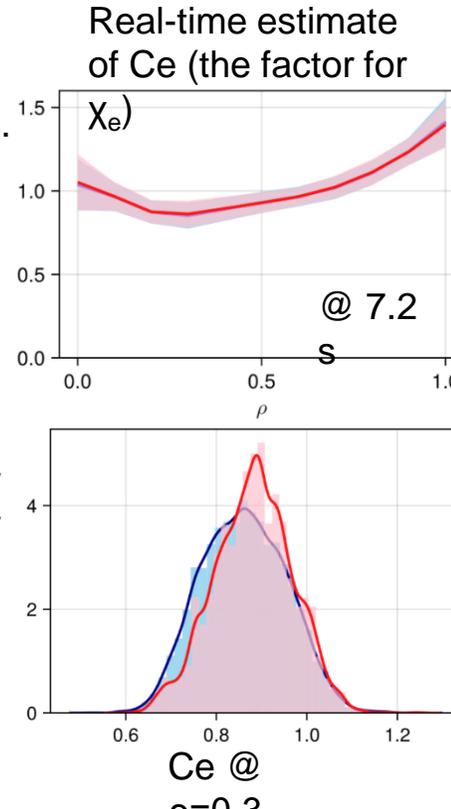
$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.6 \text{ m}, \text{CCW}, 2.75 \text{ T}, 1.254, 100 \%)$

Motivation and objective:

To demonstrate the real-time plasma control using the data assimilation-based control system (ASTI) running at the new Plasma Simulator, located at the Rokkasho site.

Results:

- In the previous experiment, the computation time limited us to using up to 5,000 cores on Plasma Simulator. In this experiment, it has become possible to utilize up to 10,000 cores. Operation with 20,000 cores is still unstable.
- The tangential neutral beams were newly added as actuators, and NB#1–4 were under the control of ASTI.
- The figure shows an example of the results in which both the central electron temperature and ion temperature were controlled using NBI and ECH. In several experiments, the target plasma states were successfully achieved.
- Due to a communication issue, NB#4 could not be used for control in this experiment. This problem has been resolved after the experiment.
- In the next experiment (Nov. 14), we aim to achieve stable computation using 20,000 CPU cores and to demonstrate simultaneous control of electron temperature, ion temperature, and density using ECH, NBI, and gas puff.



Investigation of ion heat transport in ITG-dominant Ti-ITB plasmas (F. Kin, T. Kobayashi)

Experimental conditions: (R_{ax} , Polarity, B_t , γ , B_q)
(3.6 m, CW, 2.75 T, 1.2538, 100.0%) #196109-#196178

Aim:

Induce ion heat transport by modulate Te/Ti using off-axis MECH

Method: Compare Ti-ITB and L-mode

Low density ($1.5 \times 10^{19}/m^3$), Full-NBI (#1-5) for Ti-ITB

Low density ($1.5 \times 10^{19}/m^3$), Reduced-NBI(#1,4,5) for L-mode

Results:

- Successfully reproduced Ti-ITB without MHD disturbance
- Several ECH operations: (1)off-axis MECH (2)off-axis MECH+on-axis ECH (3)on-axis MECH
- Te modulation is confirmed by ECE
- Ti seem to fluctuate irregularly, especially in core
- Fast CXS data is obtained and will be analyzed

#196140 (off-axis MECH + on-axis ECH)

