Daily Report for 2025-10-24

M. Igami

Date: October 24, 2025
Time: 10:00 – 17:15
Shot: 195291 – 195421 (131 shots)
Prior wall conditioning: H2
Divertor pump: No
Gas puff: H2, N2, Ne, Ar
Pellet: No

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

Topics

1. Establishing a diagnostic technique for concentration of impurity nitrogen ion using collisional radiative analysis combined with divertor spectroscopy (Hiroyuki. Takahashi)
2. The evaluation of the toroidal uniformity of the boron deposition on the divertor plates for effective real time boronization using the impurity powder dropper (a high plasma density condition) (M. Shoji)
3. The sustainment of divertor detachment by impurity dust particle injection into the magnetic island in the LHD peripheral plasma using the IPD (M. Shoji)
4. Study of mode coupling and nonresonant effects in RMP response (S. Lee)

Establishing a diagnostic technique for concentration of impurity nitrogen ion using collisional-radiative analysis combined with divertor spectroscopy

H. Takahashi (Tohoku Univ.) and M. Kobayashi+

Experimental conditions:

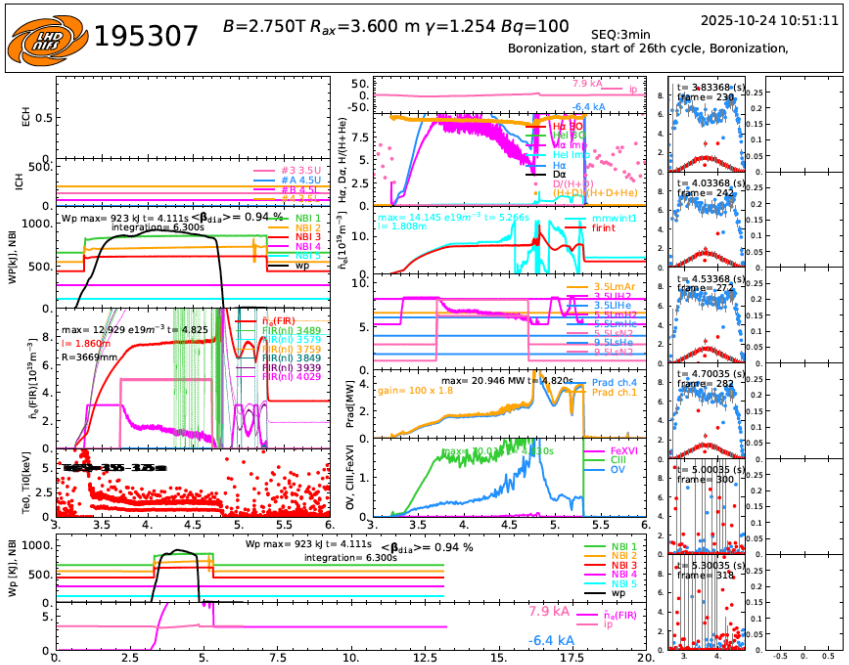
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%)
#195291 - #195328

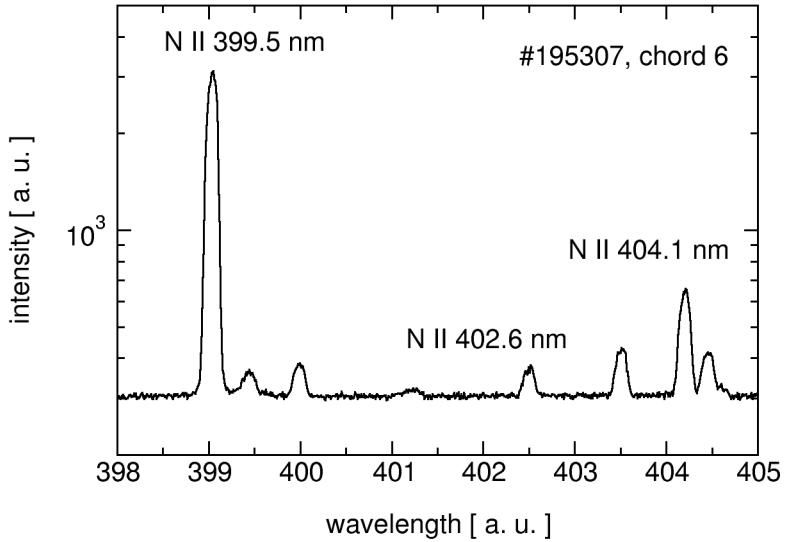
Motivation and method:

- Develop a diagnostic technique to evaluate impurity ion density for studies of the advanced impurity seeding scenario.
- Nitrogen gas was injected into the divertor region under various electron density conditions (n_e (FIR) = 3 ~ 8 x 10^{19} m^{-3}). Line spectra from impurity nitrogen ions were collected.

Results:

- Three line-spectra from N II were clearly observed during nitrogen seeding.
- Impurity nitrogen density, electron density, and electron temperature will be analyzed based on a CR analysis.



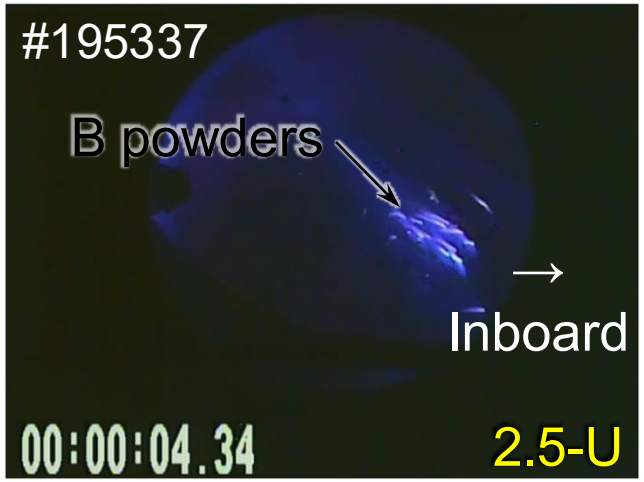


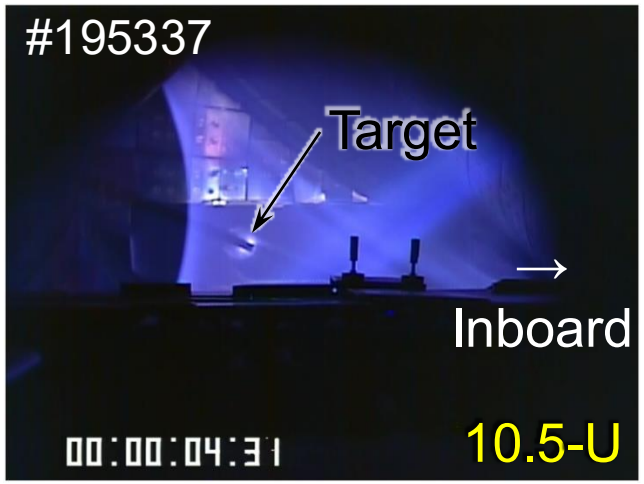
The evaluation of the toroidal uniformity of the boron deposition on the divertor plates for effective real-time boronization using the impurity powder dropper (a high plasma density condition)

M. Shoji

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%)
IPD (Boron: d=150 μm) 4~5 sec. in plasmas
#195337 - #195341





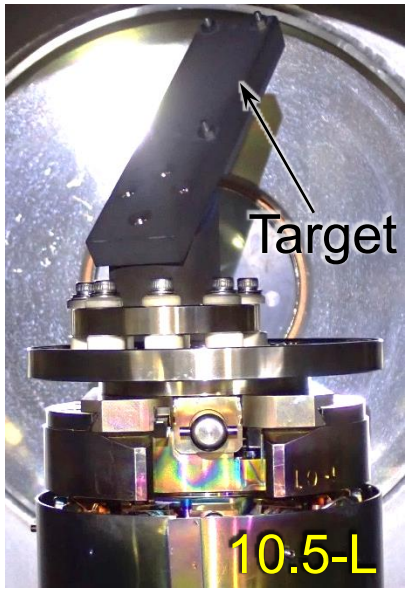
Motivation and method:

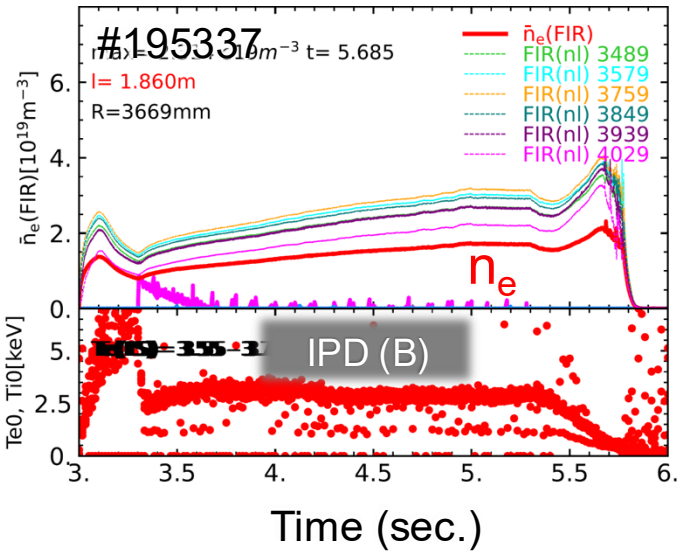
- 3-D PSI simulation using ERO2.0 predicts toroidally distributed boron deposition on divertor plates during boron powder injection under low plasma density conditions.
- Carbon target plates were exposed to the divertor plasma using two movable sample manipulators.

Results:

- The experimental condition was changed to a low plasma density ($\bar{n}_e$~1×10^{19} m^{-3}) in response to the experimental condition on the previous machine time.
- The target plates were successfully exposed to five consecutive plasma discharges.

→ Surface analysis of boron deposition will be done.



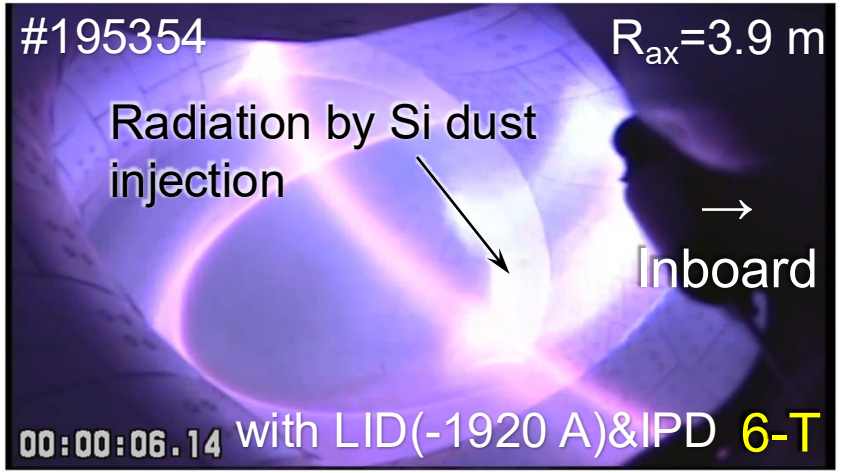


The sustainment of divertor detachment by impurity dust particle injection into the magnetic island in the LHD peripheral plasma using the impurity powder dropper

M. Shoji

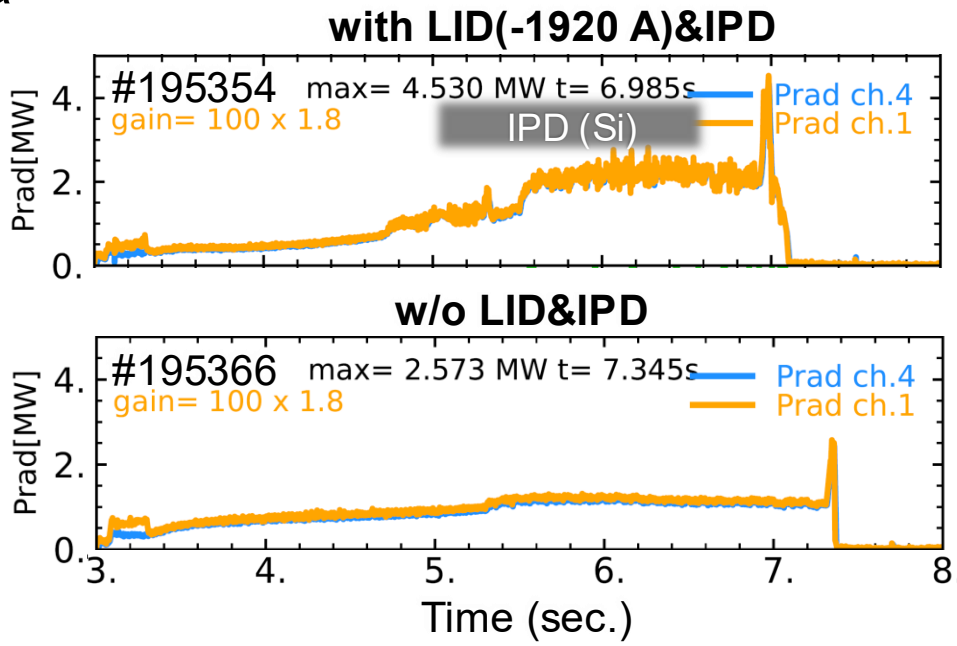
Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.9 m, CW, 1.375 T, 1.2538, 100.0%)
#195347-#195368
(R_{ax}, Polarity, B_t, γ, B_q) = (3.8 m, CW, 1.375 T, 1.2538, 100.0%)
#195369 - #195382
IPD (Si: d=75 μm) 5~6.5sec. in plasmas, I_{LID}=-1920A～1920 A



Motivation and method:

- Sustaining divertor detachment is a critical challenge for reducing the heat load on plasma-facing components in magnetic plasma confinement devices.
- To facilitate the transition to the divertor detachment regime, Si dust particles were injected into the magnetic island in the peripheral plasma, thereby enhancing radiation power (P_{rad}).



Results:

- P_{rad} was successfully enhanced and sustained by dust particle injection into the magnetic island with negative LID coil current.
- Positive LID coil current was less effective in enhancing P_{rad}.

→ Detailed analysis will be done using EMC3-EIRNE & DUSTT.

Multi modal and m=2 RMP effect on LHD plasma

S. Lee

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CW, 0.75 T, 1.254, 100.0%), #195383 – #195411,

(R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CW, 0.75 T, 1.254, 100.0%) #195412 – #195420

Motivation and method:

- Investigating the multi-modal RMP effect on 1/1 penetration
- Studying pure m=2 RMP (2/1, 2/3) effects on LHD plasma
- By adjusting RMP coil current in LHD system, applying 1/1, 2/1, 2/3, 1/1+2/1, … modes of RMPS.

Results:

- No plasma when NBI 4&5 were open for CXS
- Hard to observe pure 2/1, 2/3 penetration due to low amplitudes
- 1/1 RMP threshold increased when 2/1, 2/3 mode perturbations were applied