

# Daily Report for 2025-11-20

Y. Kawamoto

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**Date:** November 20, 2025

**Time:** 10:00 – 18:45

**Shot:** 197375 – 197542(167 shots)

**Prior wall conditioning:** No

**Divertor pump:** Yes

**Gas puff:** H<sub>2</sub>, N<sub>2</sub>, Ne, Ar

**Pellet:** impurity pellet (Mo, Fe, B, LiF, Ta, Re, Os, Ir, Cs<sub>2</sub>Co<sub>3</sub>)

**LID:** Yes

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

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

**ICH:** No

## Topics

1. Optimization of impurity radiation with edge magnetic structure, heating scheme, and impurity species(M. Kobayashi)
2. Experimental identification of spectral lines from highly charged heavy ions(C. Suzuki)
3. Study of trans atomic number systematics of EUV spectra of heavy-atomic multiply-charged ions(F. Koike,I. Murakami)
4. Advanced turbulence control for achieving high-pressure plasma(H. Sakai)
5. Investigation of direct interaction between fast-ion and turbulence(H. Sakai)

# Optimization of impurity radiation with edge magnetic structure, heating scheme, and impurity species

M. Kobayashi, R.T. Ishikawa,  
M.I.N. Kobayashi, K. Nagaoka (NIFS)

## Experimental conditions:

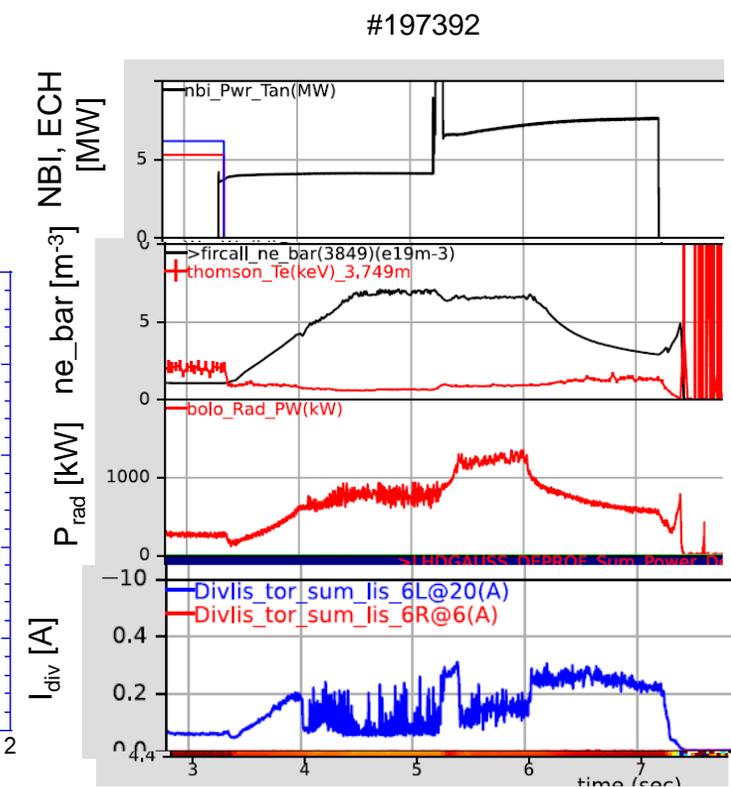
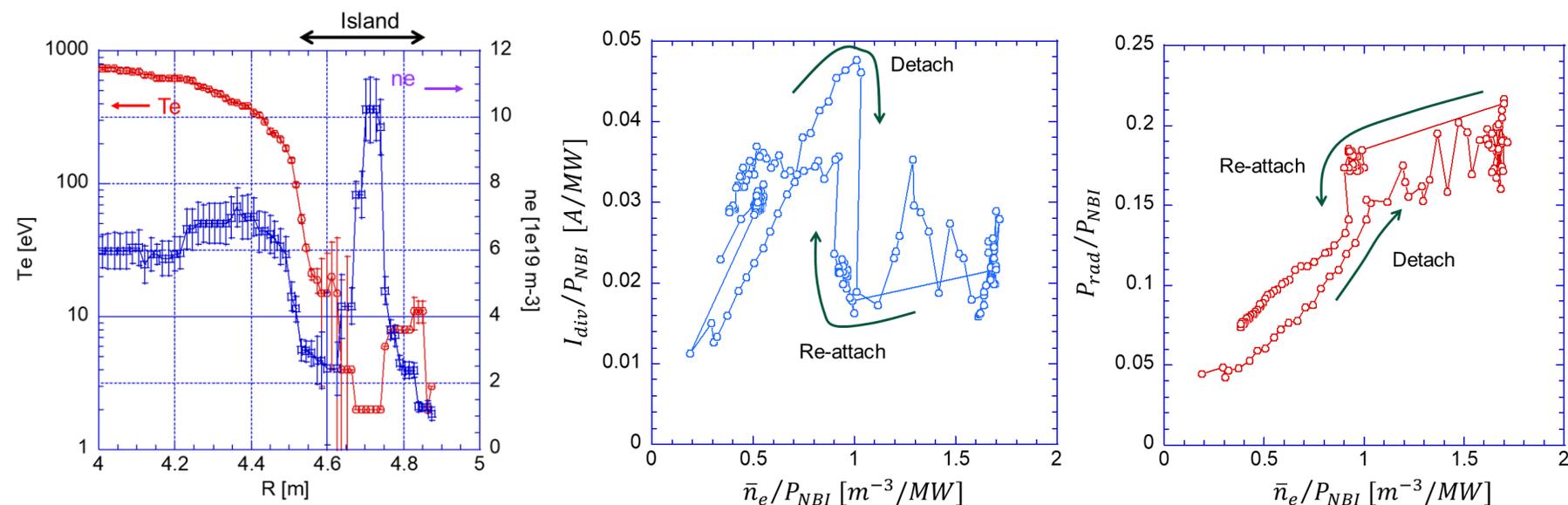
$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.9 \text{ m}, \text{CCW}, 2.54 \text{ T}, 1.2538, 100.0\%), I_{RMP} = 3300\text{A}, \#197385 - \#197406$

## Motivation and method:

- Detachment involves strong nonlinearity because energy transport and impurity radiation depend on temperature.
- Density was ramped up and down to induce detachment and reattachment in order to investigate any nonlinear behavior of radiatively cooled plasmas. RMPs were applied to induce edge islands.

## Results:

- Clear condensation at the island was observed during detached phase,  $T_e \sim 2 \text{ eV}$ ,  $n_e \sim 10^{20} \text{ m}^{-3}$ , indicating strong radiative cooling trapped at the island.
- Relations between divertor particle flux, radiated power and density exhibit hysteresis during the detachment and re-attachment transition, reflecting non-linearity of detached plasmas. Further experiments with impurity seeding are planned to investigate impact of different radiation function on the hysteresis behavior.



# Experimental identification of spectral lines from highly charged heavy ions

## Study of trans atomic number systematics of EUV spectra of heavy atomic multiply-charged ions

C. Suzuki, F. Koike (Sophia U.) and I. Murakami

### Experimental conditions:

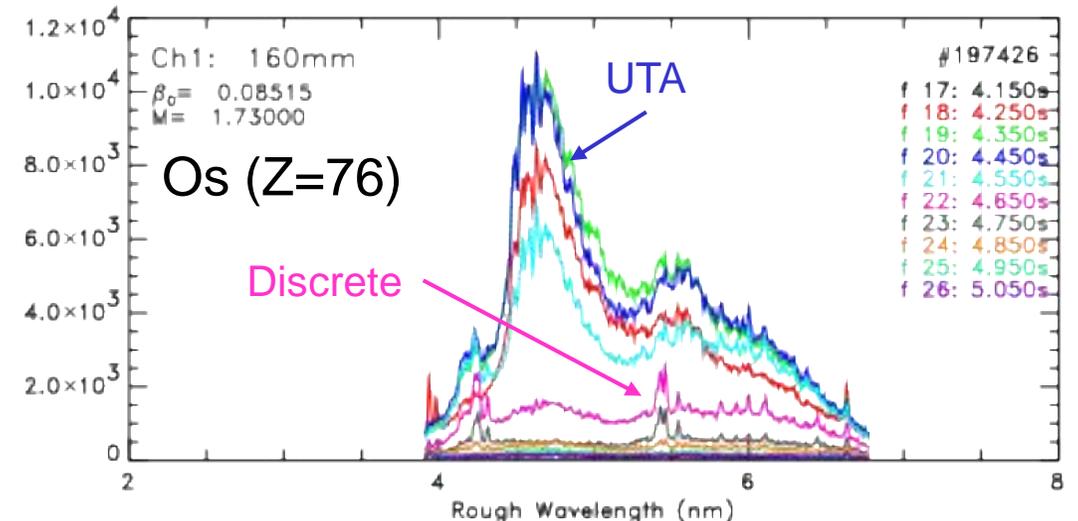
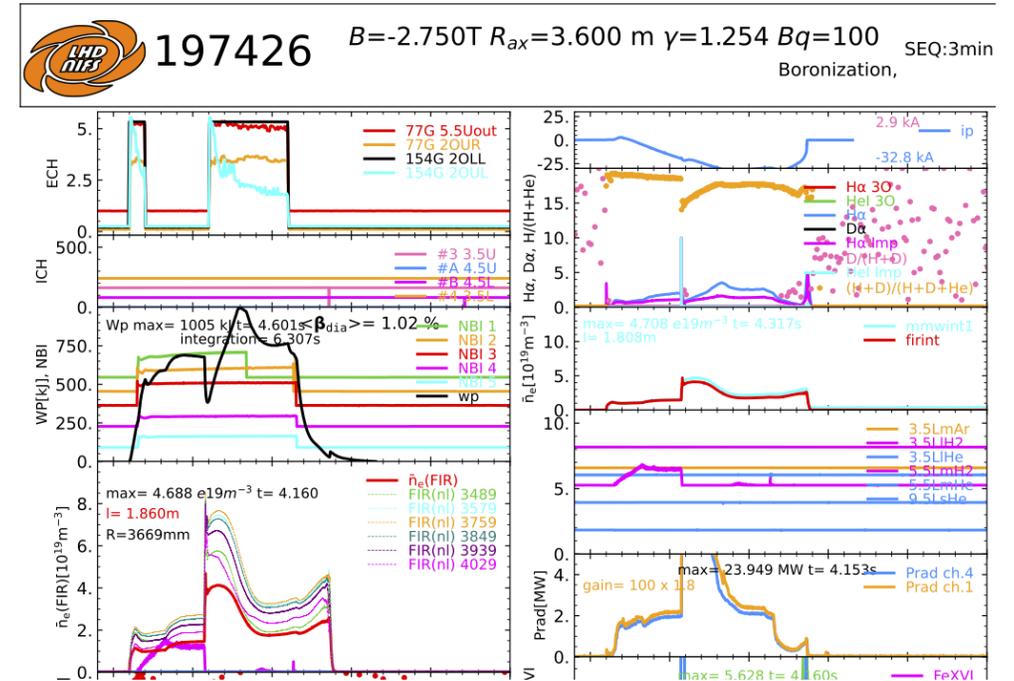
$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.6 \text{ m}, \text{CCW}, 2.75 \text{ T}, 1.2538, 100.0\%)$   
 #197407 - #197440

### Motivation and method:

- Atomic number dependence of EUV/soft X-ray spectra for highly charged heavy ions should be further investigated.
- Various heavy elements (Sb, Te, Cs, Ta, Re, Os, Ir) are injected by TESPEL or impurity pellet and emission spectra are measured by multiple spectrometers.

### Results:

- Quasi-continuum UTA spectra were observed for all the elements in the 4–14 nm range.
- Discrete spectral feature in high-temperature conditions was also observed for some of the heavy elements.



# Advanced turbulence control for achieving high-pressure plasma

H. Sakai (QST)

## Experimental conditions:

$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.6 \text{ m}, \text{CCW}, 2.75 \text{ T}, 1.2538, 100.0\%)$   
#197444 – #197468

## Motivation and method:

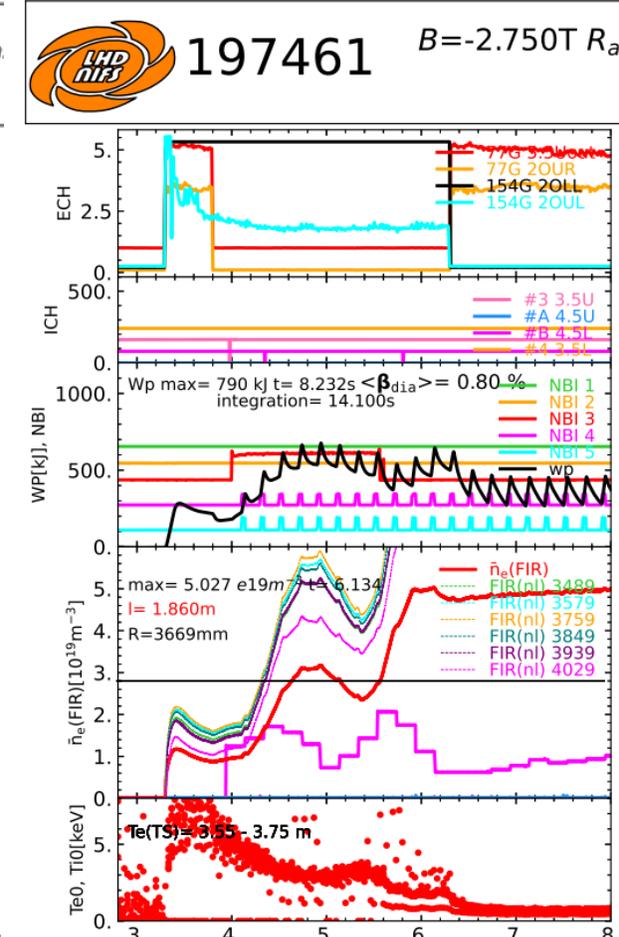
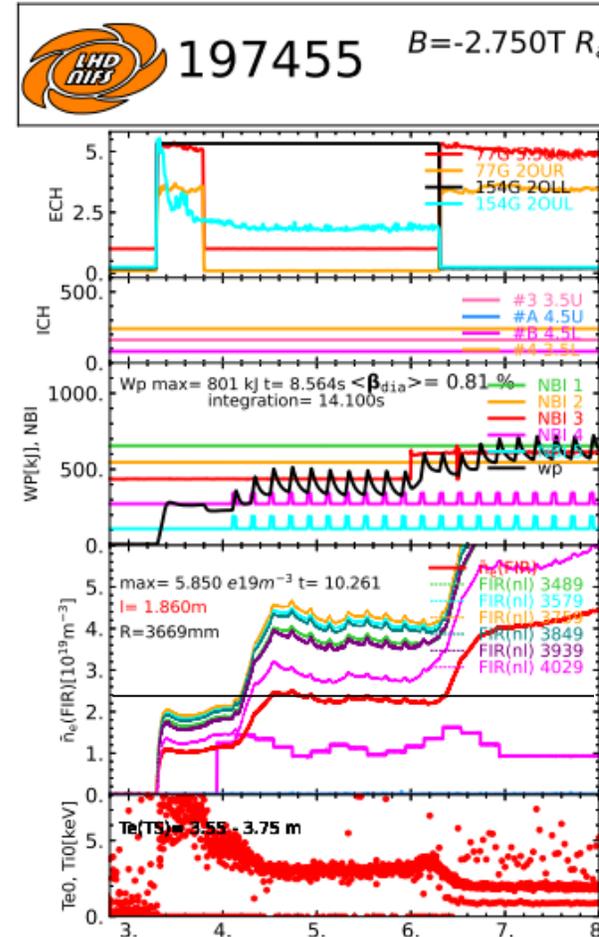
- A new turbulence control scheme using gas-puff and ECH was verified.

## Results:

- New turbulence control scheme was applied and worked as programmed, but unfortunately, large over-shooting was occurred in different heating.
- The settings to control the ECH with an external signal did not work properly, so it was not possible to use the ECH for control. If the ECH could be used, quick convergence could be expected while avoiding overshoot.

Final experiment is scheduled at Dec. 19th (long pulse day).

Some trouble should be solved and improved turbulence control scheme will be performed.



# Investigation of direct interaction between fast-ion and turbulence

H. Sakai (QST), T. Nakayama (Tottori-Univ.)

## Experimental conditions:

$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.6 \text{ m}, \text{CCW}, 2.75 \text{ T}, 1.2538, 100.0\%)$   
 #197469 – #197542

## Motivation and condition:

- Investigating the effects of fast ions on turbulence
- Heating modulation, Power scan, Pulse-width scan, Density scan, and Heating-energy change were performed.

## Results:

- Turbulence reduction was confirmed during NB injection (w/o Alfvén Eigenmode).
- The fast-ion decay time showed good agreement with the turbulence return time to previous level.
- Clarifying whether the reduction is caused by fast ion or the density profile is future work.

