Daily Report for 2025-12-10

M. Goto

Date: December 10, 2025
Time: 10:00 – 18:45
Shot: 198875 – 199035 (161 shots)
Prior wall conditioning: No
Divertor pump: Off
Gas puff: H2, He, Ar
Pellet: TESPEL (Ti, Mo)

NBI: #1, #2, #3, #4, #5
ECH: 2-OUR (77GHz), 5.5-UO (77GHz), 2-OUL (154GHz), 2-OLL (154GHz)
ICH: 3.5UL, 4.5UL

Topics

1. Study of the impact of small amounts of powder injection on impurity confinement and transport (D. M. Roque, K. Mukai)
2. Effect of mixed-ion plasma on impurity transport in NBI-heated plasmas at Rax = 3.55 m (N. Tamura, K. Mukai)
3. Confinement and transport studies in helium plasmas (N. Tamura, K. Mukai)
4. Observation of large bursting emissions during He beam injection (H. Igami)
5. Optimization of ICRF heating scenarios to control energetic ion distribution function in phase space (N. Tsujii, R. Seki)

Study of the impact of small amounts of powder injection on impurity confinement and transport (D.M. Roque(Ciemat), N. Tamura(IPP), K. Mukai, I. García Cortés(Ciemat), K. J. McCarthy(Ciemat) et al.)

Magnetic configuration: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%)

Shots: #198875 - #198890 (16 shots, incl. NBI calib shot: #198890)

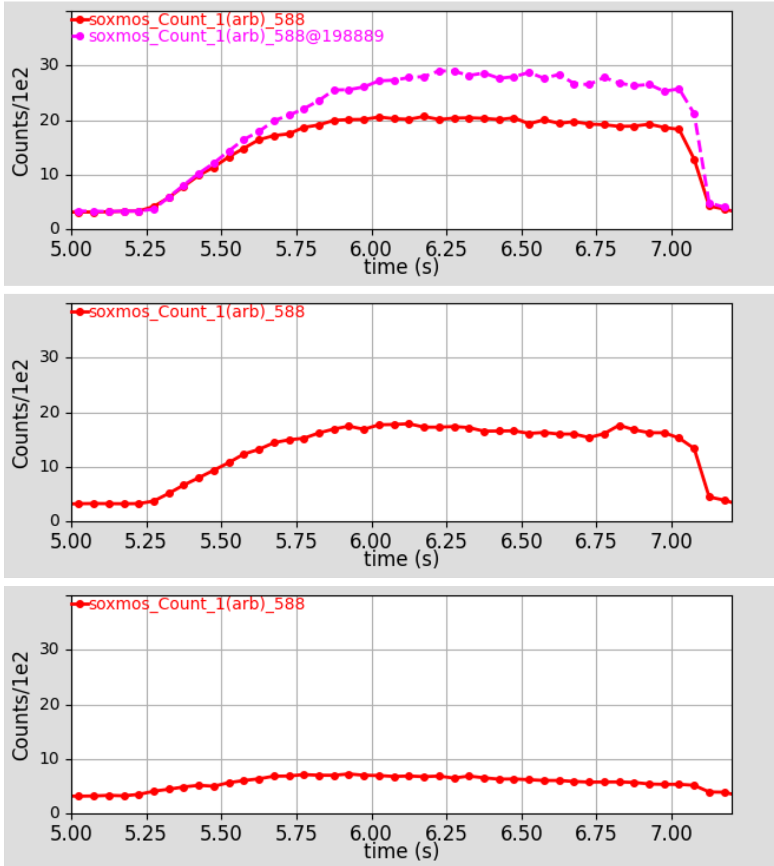
Goal of this experiment:

- Study the impact of IPD powder drop rate (Li) on mid/high Z impurity confinement using TESPEL
  - ✓ Previous studies revealed an unexpected reduction in confinement time when Li granule dropping made

Results

- We were able to complete the experiment under conditions that were previously not possible due to problems with the TESPEL injector
- We found that **increasing the voltage applied to the IPD (1.5 V → 3.0 V → 4.5 V) reduced the line emission from molybdenum (Mo) injected by TESPEL**
  - ✓ **We have demonstrated, for the first time in the world, that impurities in the core plasma can be controlled by adjusting the amount of impurities supplied by the IPD**
- Changes in transport of Mo and Ti (data already obtained on Nov 21, 2025) will now be analyzed

Temporal behaviour of Mo XXXI, 11.6 nm

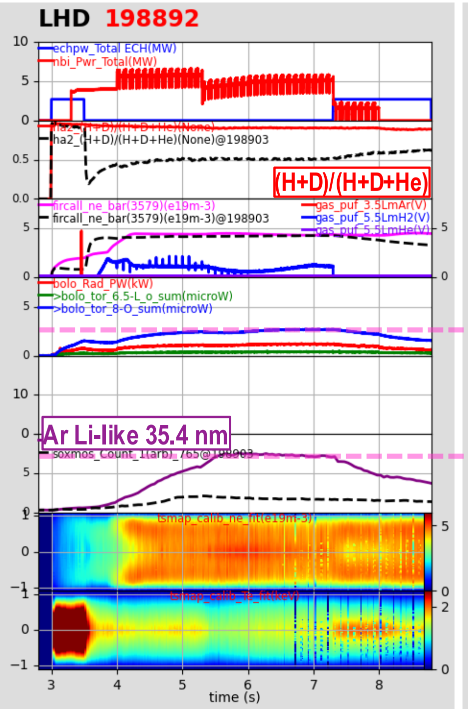


Effect of mixed-ion plasma on impurity transport in NBI-heated plasmas at Rax = 3.55 m

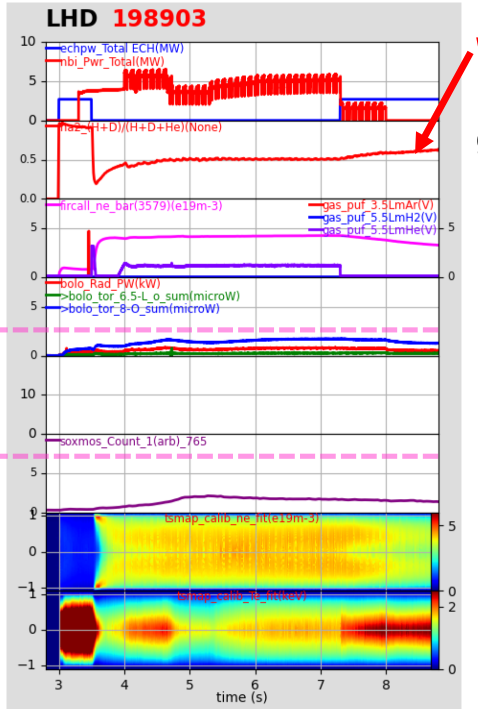
(N. Tamura(IPP), K. Mukai, K. Ida, M. Yoshinuma, A. Dinklage(IPP), K. J. McCarthy(Ciemat) et al.)

Magnetic configuration: (R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CW, 2.7887 T, 1.2538, 100.0%)
Shots: #198891 - #198905 (15 shots, incl. NBI calib shot: #198905)
Goal of this experiment: To study the change of the impurity accumulation window in H/D/He-mixed plasmas
Results: We have changed the He contents in the plasma by using different gas puff settings around n_{e_bar} of 4e19 m^{-3} under the **H-riched condition: H/(H+D) ~ 1.0**

w/o He puff



w/ He puff (feedbacked)

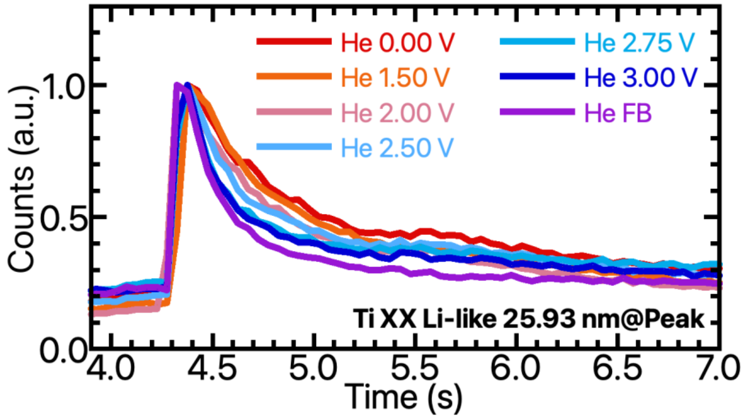


When He contents increased, as a general trends,

- **Bolometer signal level** decreased
- **Ar Li-like intensity level** decreased

Impact of He contamination on core impurity transport

- We have injected Ti-TESPEL to study the impact of He contamination on core impurity transport
  - ✓ Changes in Ti transport were observed depending on the degree of He contamination



Confinement and transport studies in helium plasmas
(N. Tamura(IPP), K. Mukai, A. Dinklage(IPP), K. J. McCarthy(Ciemat), C. Suzuki et al.)

Magnetic configuration & Shots:

(R_{ax}, Polarity, B_t, γ, B_q) = (**3.55** m, CW, 2.7887 T, 1.2538, 100.0%) #198906 - #198923 (18 shots)

(R_{ax}, Polarity, B_t, γ, B_q) = (**3.60** m, CW, 2.7500 T, 1.2538, 100.0%) #198924 - #198946 (23 shots)

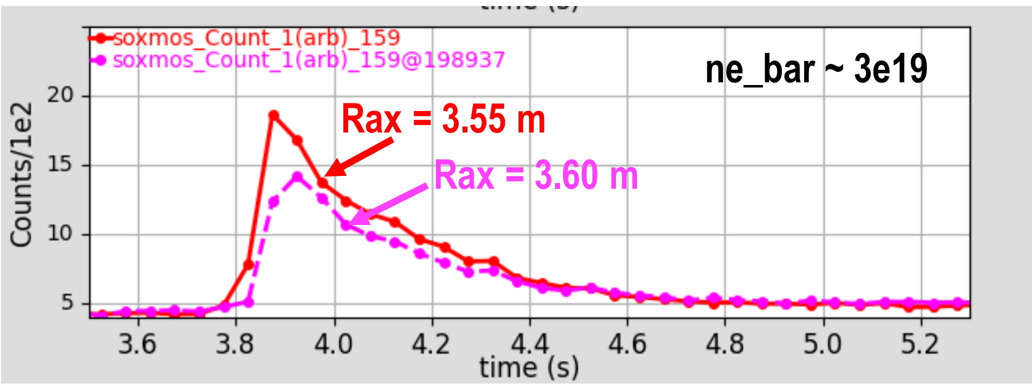
Goal of this experiment:

- Characterize pure He plasmas with different heating conditions and compare their confinement properties with those in pure H plasmas in LHD

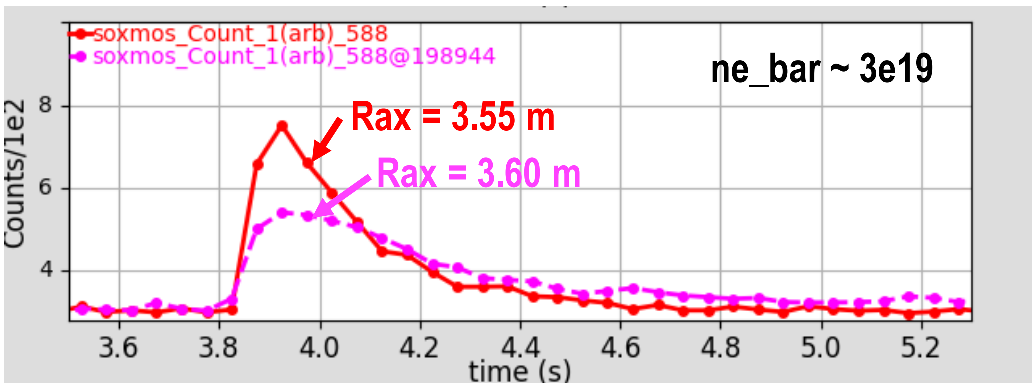
Results:

- We performed the density scan ranging from ~2e19 to ~4e19 for each config.
- Changes in impurity transport due to differences in magnetic configuration were observed (see below)
- Comprehensive comparisons will be made with previously obtained data for hydrogen and deuterium

Temporal behaviour of Ti XX, 25.9 nm



Temporal behaviour of Mo XXXI, 11.6 nm



Observation of large bursting emissions during He beam injection

H. Igami, Hong and G. Yun et al

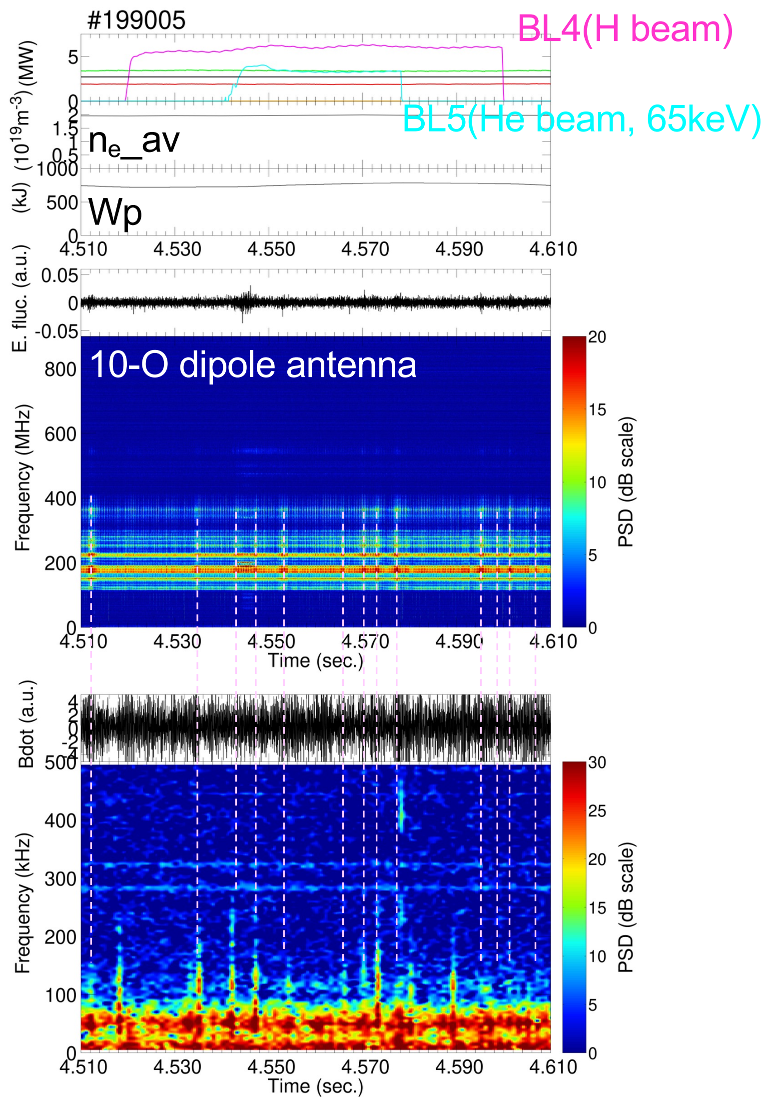
Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%)
#198950 - #199006

Motivation and method:

- Investigation of the mechanism of abrupt bursty enhancement of MHz-GHz range emissions during He beam injection
- Reproducing of large bursty observed in 22nd exp. campaign to measure high energy particle distributions

Results:

- Abrupt large bursty RF emissions were observed with H/(H+He) ~ 0.3 and $n_e = 2.0\times10^{19}\mathrm{m}^{-3}$
- Timings of abrupt frequency chirping of B-dot probe signal were not necessarily coincide with large RF bursts
- Fine periodic (~4kHz) small RF bursts were also observed
- Spatial and velocity distributions of high energy particles measured by CXS, DNPA, INPA, Si-NPA will be analyzed



Optimization of ICRF heating scenarios to control energetic ion distribution function in phase space

N. Tsujii, R. Seki, J. Wang,
T. Seki and H. Yamaguchi

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.85 T, 1.2538, 100.0%)
#199008 - #199035

Motivation and method:

- Explore ICRF+NBI heating scenario for efficient energetic ion generation
- Observe how mode conversion heating deforms bulk and beam ion distribution
- Scan the mode conversion layer with hydrogen fueling

Results:

- Obtained fast ion measurements with various combination of ICRF and NBI waveforms
- Hydrogen concentration was scanned between n_H/n_e ~ 10-40 %