(MAP) Session Report

April. 12, 2024 (G. Motojima)

Date: April 11, 2024
Time: 14:20 - 16:45
Shot#: #189413 – #189459 (47 shots)

Prior wall conditioning: NO
Divertor pump: ON
Gas puff: H2, C pellet, TESPEL
IPD: ON
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(4.8, 4.3, 4.3, 3.7, 6.0)MW

ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(698, 380)kW
ECH(154GHz)=ant(2-OLL, 2-OUL , 2-OLR)=P(705, 889, 982)kW
ECH(56GHz)=ant(1.5U)=P(-)kW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0.0, 0.0, 0.0, 0.0)MW

Topics

1. The evaluation of the toroidal uniformity of impurity deposition for effective real-time wall conditioning using the IPD (M. Shoji)
2. Impurity transport study in the plasma with an impurity hole by means of TESPEL (D.M. Roque(Ciemat), N. Tamura)

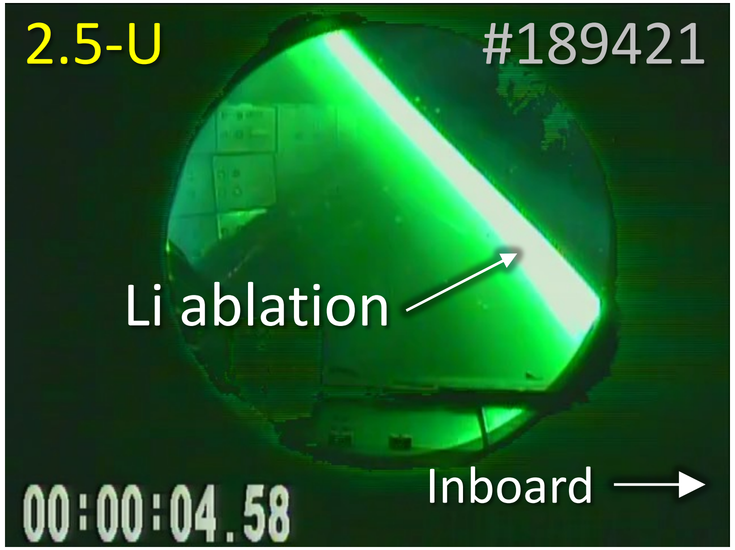
The evaluation of the toroidal uniformity of impurity deposition for effective real-time wall conditioning using the Impurity Powder Dropper

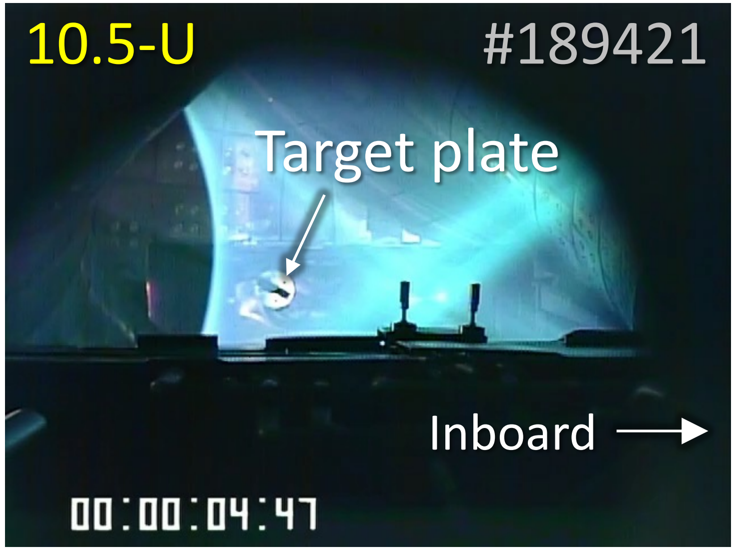
(M. Shoji)

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CW, 2.75 T, 1.2538, 100%), Shots: #189413 - #189434

ECH: only for start-up, NBI: 1-5, IPD: Lithium



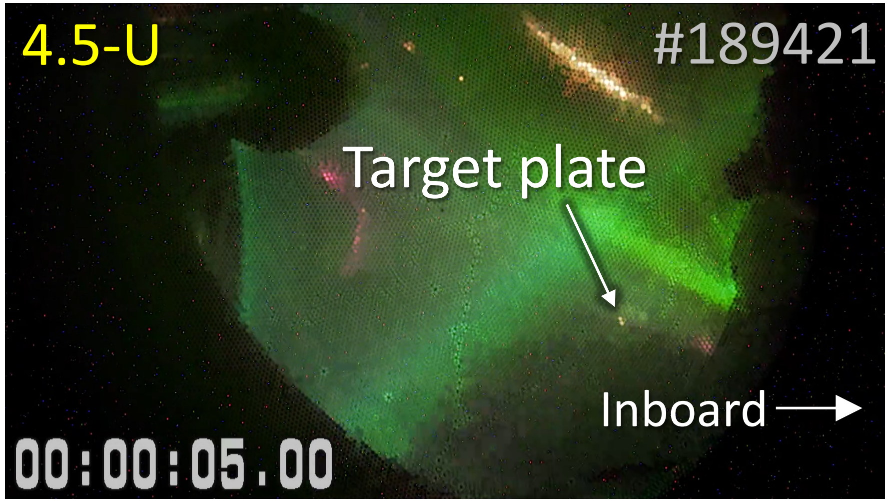


Objective:

The toroidal uniformity of the impurity deposition on divertor plates by impurity powder injection is investigated using two manipulators installed in different toroidal positions (4.5-L and 10.5-L) for different impurity powders (boron and lithium).

Experiment:

Lithium powders (d=500 μm) were dropped from the impurity powder dropper (IPD) in low-density plasma discharges ($\bar{n}_e \sim 1.5 \times 10^{19}$ m^{-3}), in which carbon target plates were exposed to a lower divertor leg in two different toroidal positions (4.5-L and 10.5-L) for R_{ax}=3.60 m.



Results:

The two target plates were successfully exposed to the divertor plasma for 16 discharges. The deposited lithium density profile on the plates will be compared to that of boron and investigated by PSI simulation codes.

Transport studies of TESPEL injected impurities in plasmas during impurity hole (D. Medina Roque, N. Tamura, I. García Cortés, K. J. McCarthy et al.)

Magnetic configuration: (R_{ax}, Polarity, B_t, γ, B_q) = (3,55 m, CW, 2.789 T, 1.2538, 100.0%)
Shots: #189436 - #189459

Goal of this experiment

- To characterize impurity transport in impurity hole hydrogen plasma conditions in LHD, we use 700um-shell type TESPELs containing single tracers.
- Obtain data for comparisons with future results in W7-X and TJ-II.

Background & Motivation

- The impurity hole phenomenon seems to be characterized by a **+ve E_r** at **the plasma edge** and a -ve **E_r** in the **plasma core → different convection velocities** of impurities if neoclassical transport is relevant.
  - ✓ Estimate an impurity decay time from the line intensity evolution for injected elements (**Ti, Cu, and Mo**) for plasmas w/ and w/o impurity hole using EUV/VUV spectrometer SOXMOS (its wavelength range from 19.7 to 34.1 nm with a 133.6 g/mm grating for Ti, from 14.5 to 27.4 nm with a 133.6 g/mm for Cu, and from 8.9 to 13.2 nm with a 600 g/mm grating for Mo).
- Comparison of experimental results obtained with and without impurity hole in NBI heated plasmas with a considered electron density range of 1E19

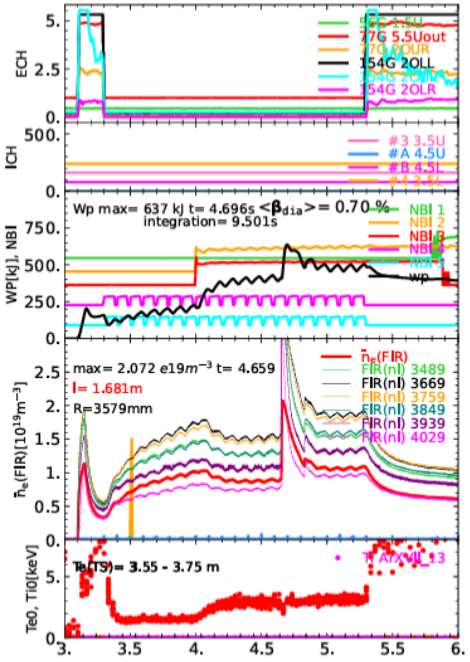
Transport studies of TESPEL injected impurities in plasmas with and without an impurity hole (D. Medina Roque, N. Tamura, I. García Cortés, K. J. McCarthy et al.)

Results

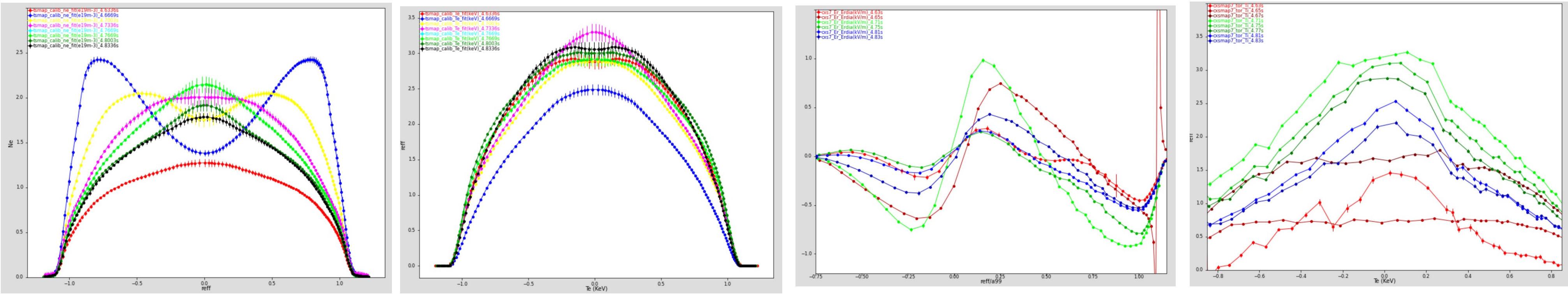
- **17 TESPELs are successfully injected at 4.825s (9 into w/ imp hole)** and **(8 into w/o imp hole)** with carbon pellet at 4.6s and n_e of 1e19 m^{-3}
  2 heating patterns are applied
  A) w/o imp. hole, NB#1(5.8s-7.8s), NB#2,3(3.3s-5.3s), NB#4,5(4s-6s)
  B) w imp. hole, NB#1(5.8s-7.8s), NB#2,3(4s-6s), NB#4,5(3.3s-5.3s)

- We obtained data for all impurities w/ and w/o imp. hole plasmas.
- Preliminary analysis of Er and profiles evolution shows **no difference between w/ and w/o**.
- Impurity confinement time from SOXMOS signals and Er from HIBP will be analyzed.

Typ waveforms



A)



B)