(MAP) Session Report

Date: Mar. 27, 2024
Time: 10:35 – 16:44
Shot#: 188257 – 188374 (117 shots)
Prior wall conditioning: He glow
Divertor pump: Off
Gas puff: H_2
Pellet: None

Mar. 28, 2024 (C. Suzuki)

NBI#(1, 2, 3, 4, 5) = gas(H, H, H, H, H)=P(4.2, 4.0, 4.1, 3.3, 3.2) MW
ECH(77GHz) = ant(1.5-Uo, 5.5-U, 2-OUR)=P(-, 0.70, 0.38) MW
ECH(154GHz) = ant(2-OLL, 2-OUL, 2-OLR)=P(0.92, 1.06, 0.98) MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -) MW

Topics

1. The investigation of the impurity shielding performance of the LHD peripheral plasma using the Impurity Powder Dropper (a low plasma density condition) (M. Shoji)
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 low plasma density condition) (M. Shoji)
3. Spectroscopic studies of boron hydrides near plasma-facing materials during boron powder dropping experiments (T. Kawate)

Investigation of the impurity shielding performance of the LHD peripheral plasma using the Impurity Powder Dropper (IPD)

(M. Shoji)

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CW, 2.64 T, 1.2538, 100%), Shots: #188262 - #188271
= (3.60 m, CW, 2.75 T, 1.2538, 100%), Shots: #188273 - #188281

ECH: only for start-up, NBI: BL1+BL2+BL3+BL4+BL5, IPD: Li, Si, B

Objective:

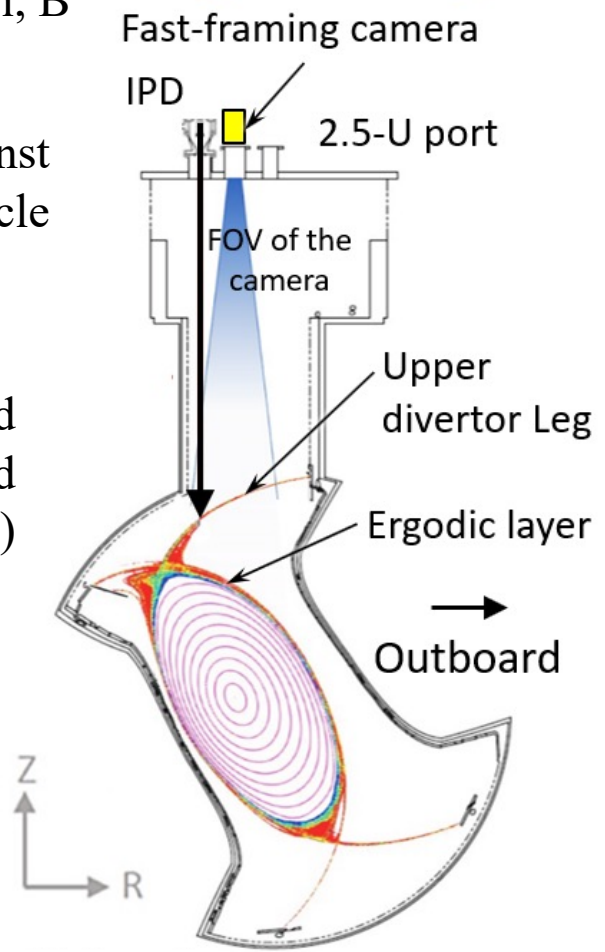
The shielding performance of the LHD peripheral plasma against impurity dust particles was investigated by measuring the dust particle trajectories and the ablation positions using a fast-framing camera.

Experiment:

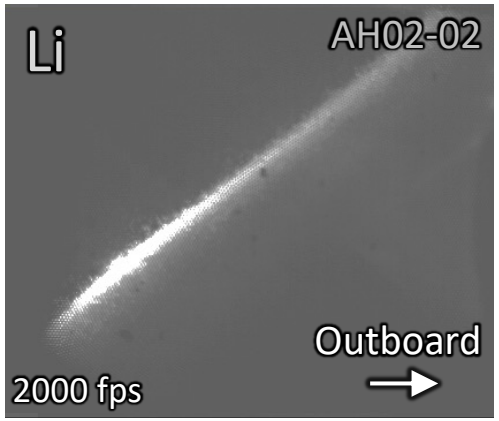
The ablation positions of impurity dust particles (Li, Si, B) dropped from the IPD were observed with the fast-framing camera (installed next to the IPD) in low-density plasma discharges ($\bar{n}_e \sim 2 \times 10^{19}$ m^{-3}) for two different magnetic configurations (R_{ax}=3.60 m and 3.75 m).

Results:

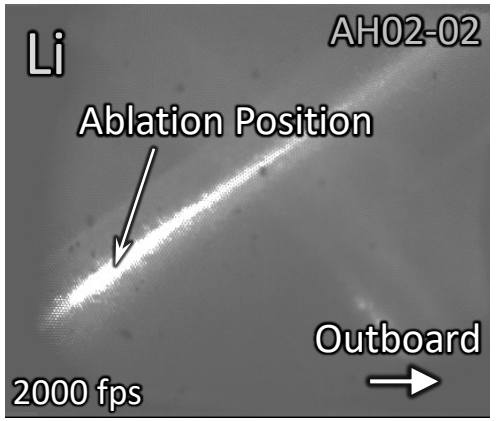
The ablation positions of dropped Li dust particles (d=500 μm) for both magnetic configurations were almost the same, which is different from those in the high-density plasma discharges performed on 19th March. It can be explained by the lower plasma flow effect in the upper divertor leg on the dust trajectories.



#188279 R_{ax}=3.60 m



#188265 R_{ax}=3.75 m



Evaluation of the toroidal uniformity of the boron deposition on the divertor plates for effective real-time boronization 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: #188285 - #188330
ECH: only for start-up, NBI: BL1+BL2+BL3+BL4+BL5, IPD: Li, Si, B

Objective:

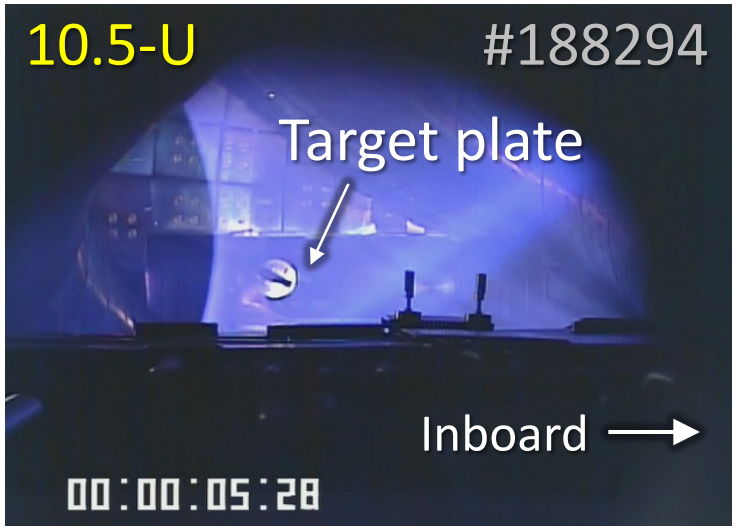
The toroidal uniformity of the boron deposition on divertor plates by boron powder injection is investigated using two manipulators installed in different toroidal positions for both low and high-density plasmas.

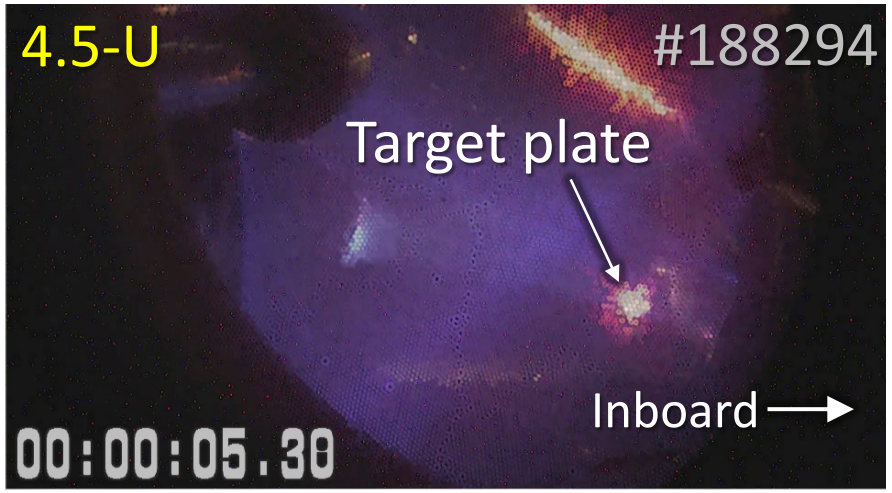
Experiment:

Boron powders were dropped by the impurity powder dropper (IPD) in low-density plasma discharges ($n_e \sim 1.5 \times 10^{19}$ m^{-3}), in which carbon target plates were exposed to the divertor plasma in two different toroidal positions (4.5-L and 10.5-L) for R_{ax}=3.60 m.

Results:

The target plates were successfully exposed to the divertor plasma for about 20 discharges. The deposited boron density profiles on the plates will be investigated and compared to simulations which predict more toroidally uniform boron deposition for low-density plasmas. The investigation of the ablation positions of the impurity dust particles for medium-density plasma discharges ($n_e \sim 3 \times 10^{19}$ m^{-3} and 4×10^{19} m^{-3}) was also performed.





Spectroscopic studies of boron hydrides near plasma-facing materials during boron powder dropping experiments

Kawate et al.

Background: We confirmed real-time depositions of boron onto diverter regions during IPD via BH molecular spectroscopy. For investigation of formation processes of BH during boronization (i.e., validity of diagnostics of boron deposition by BH molecular spectroscopy), we propose spectroscopic measurements of BH^+ and BH_2, which can be reactant/product of BH molecules

Experimental conditions:
$(R_{ax}, B_t, \gamma, B_q) = (3.6\ m, 2.75\ T, 1.254, 100\%)$, CW, H_2 gas
#188331 – 188374, IPD with B powder

Results:

- We confirmed emissions from BH^+ molecules around 379 nm during boron powder injection. On the other hand, we cannot find BH_2 ~330 nm emission (due to the low efficiency of the detector in UV or less BH_2 amount...?).
- We performed experiments with different amount of boron as well as different NBI conditions (to compare different Te of diverter plasmas).
- We will investigate temporal evolutions/spatial distributions of BH, BH^+, B^0, and B^+ emissions to understand chemical kinetics of these atoms and molecules during boron deposition onto plasma-facing materials.