

(TG1) Multi-ion group report



Date: Feb. 9, 2022

Feb. 10, 2022 (G. Motojima)

Time: 9:51-12:30

Shot#: 178560-178613 (54shots)

Prior wall conditioning: He glow

Divertor pump: No

Gas puff: He

IPD: Yes

NBI#(1, 2, 3, 4, 5) = gas(H, H, H, H, H) = P(2.0, 1.1, 1.8, 3.4, 3.2) MW

ECH(77 GHz) = ant(5.5-Uout, 2-OUR) = P(703, 792) kW

ECH(154 GHz) = ant(2-OLL, 2-OUL, 2-OLR) = P(979, 930, 986) kW

ECH(56 GHz) = ant(1.5U) = P(-) kW

ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-) MW

Neutron yield integrated over the experiment = 4.3×10^{11} (day total)

Topics

1. Helium pumping with boron powder dropping (S. Masuzaki)
2. Effect of Boron powder injection on wall retention in LHD with Helium plasma (Z. Sun, N. Ashikawa)

Helium pumping with boron powder dropping

2022/2/9 S. Masuzaki

Shot #: 178560-178588, $(R_{ax}, B_t, \gamma, B_q) = (3.6 \text{ m}, -2.75 \text{ T}, 1.2538, 100.0\%)$

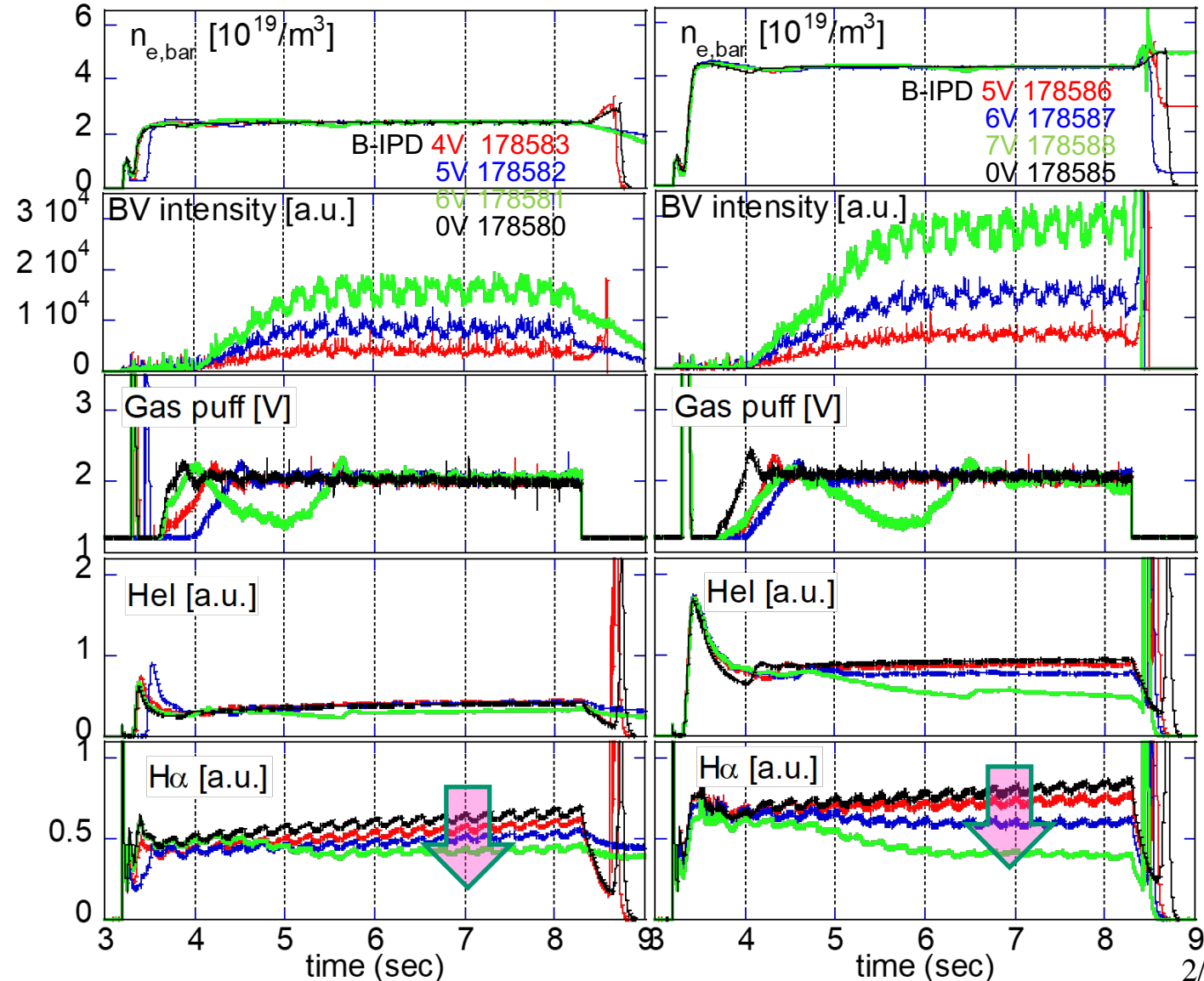
Working gas: He, $P_{NBI1} \sim 2 \text{ MW}$, $P_{NBI2} \sim 1 \text{ MW}$, $P_{NBI3} \sim 2 \text{ MW}$, $P_{ECH} \sim 4 \text{ MW}$ only for start-up

Motivation: He pumping by B-IPD has been observed in RF long pulse discharges. This experiment is the first systematic investigation of He pumping by B-IPD in NBI plasmas.

Experiment: He plasmas with densities of 2.5 and 4 E19/m3 were sustained by t-NBIs for $\sim 5 \text{ s}$ and density was controlled by feedback. B powder was dropped for 4 s during a discharge.

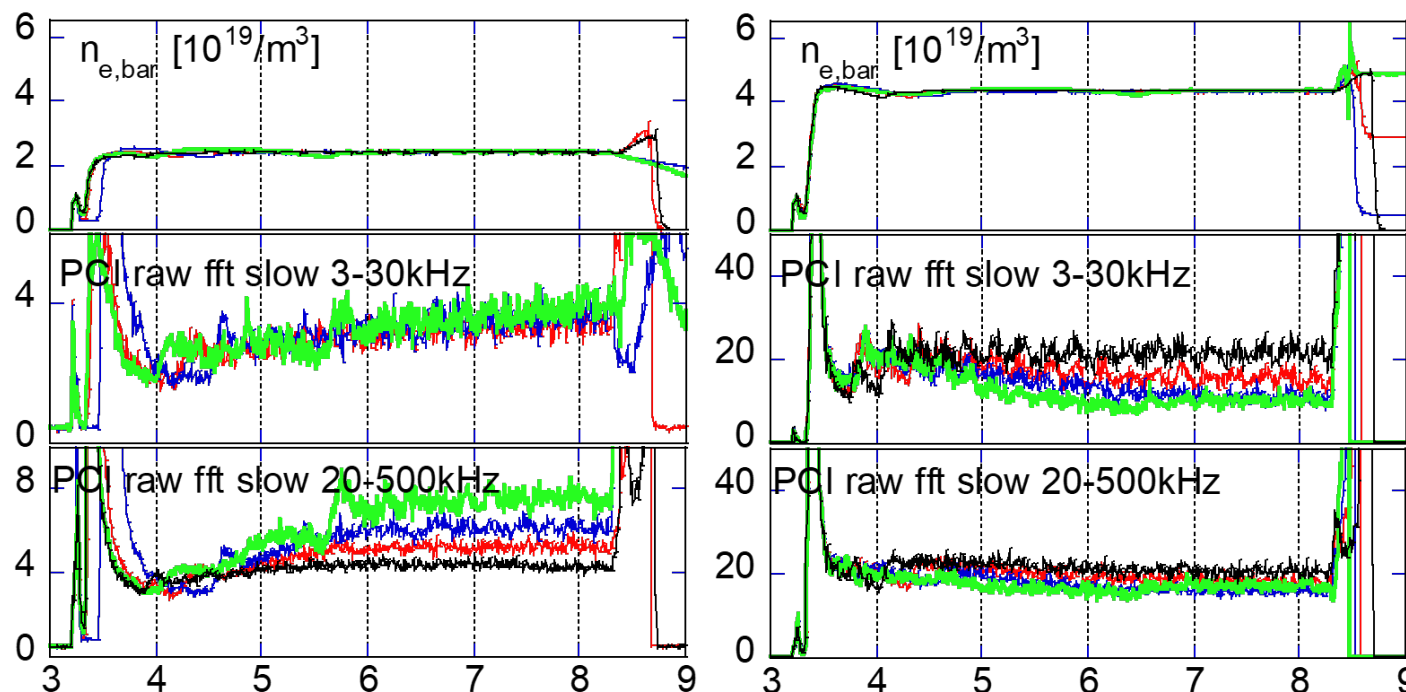
Results:

- ✓ Effect of B-IPD on fueling was not so clear except the early phase of B-IPD for large B-IPD vibration voltage.
- ✓ HeI and H α decreased by B-IPD suggesting He and H pumping.



Results:

- ✓ Different effects of B-IPD on density fluctuation were observed in He plasmas with different densities.
- ✓ For lower density case, intensity of fluctuation increased.
- ✓ For higher density case, intensity of fluctuation decreased.
- ✓ Further analyses such as B profile in plasma will be done near future.



Effect of Boron powder injection on wall retention in LHD with Helium plasma

Z. Sun, N. Ashikawa et.al.

- Shot #: 178589-178613; Working gas: He; Heating: ECH & NBI+ECH
- $(R_{ax}, B_t, \gamma, B_q) = (3.6 \text{ m}, 2.75 \text{ T}, 1.2538, 100.0\%)$

- For high He/H plasma, He-I decreased slightly with B Injection, suggesting B powder can absorb He
- Observed density decay after turning off gas puff with Boron and without Boron injection
- SSGP effect on fueling effect with B was evaluated
- Particle balance will be used to analyze the retention

