(TG3) Spectroscopy group report

Feb. 10, 2022 (T. Oishi)

Date: Feb. 9, 2022
Time: 12:33 – 18:42
Shot#: 178614 – 178730 (117 shots)
Prior wall conditioning: He GD
Divertor pump: OFF
Gas puff: H_2, Ne, Ar
Pellet: Fe (impurity pellet)

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(1.6, 1.2, 2.0, -, -)MW
ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.703, 0.792)MW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(0979, 0.930, 0.986)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0, 0, 0, 0)MW
Neutron yield integrated over the experiment = 3.7×10^{11}

Topics
1. Sustainment of divertor detachment by using feedback controlled impurity seeding (S. Masuzaki)
2. Effect of magnetic islands on impurity transport (S. Morita, T. Oishi)

Sustainment of divertor detachment by using feedback-controlled impurity seeding

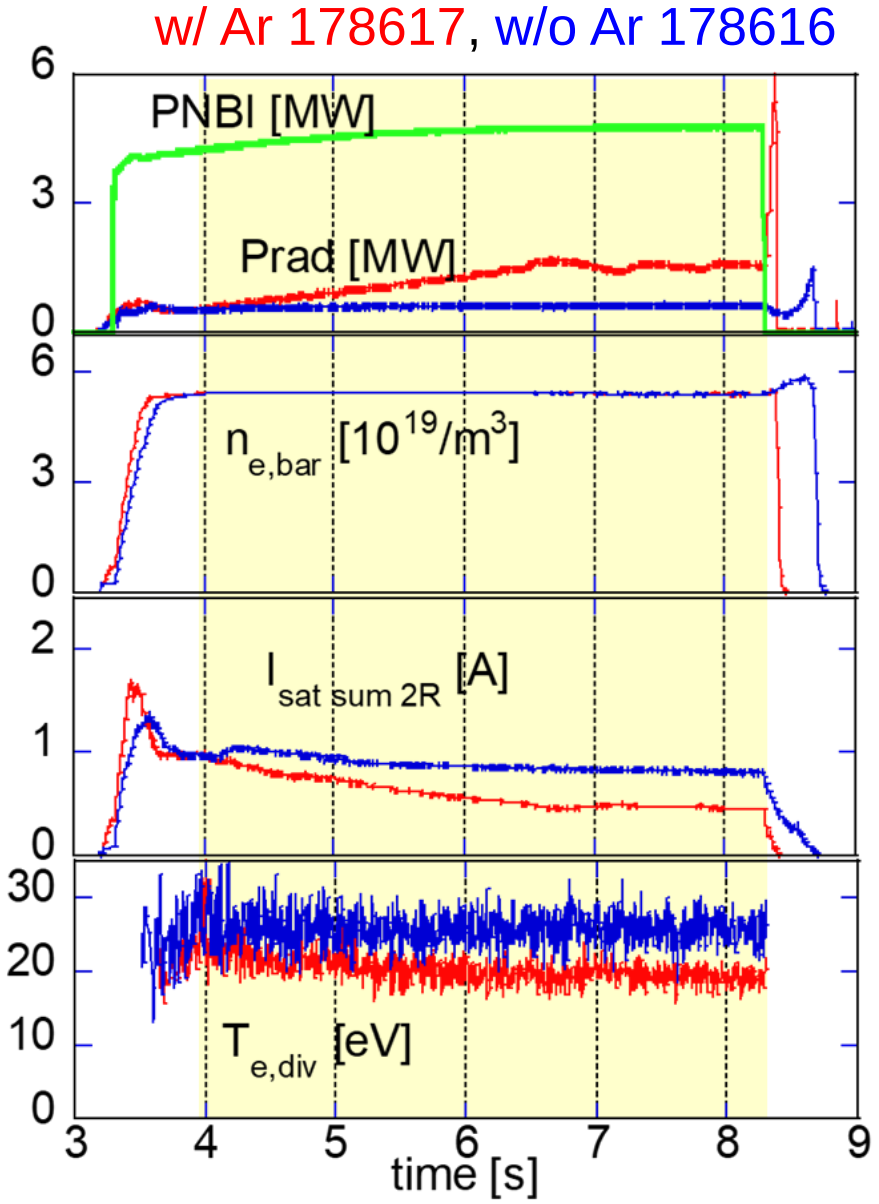
2022/2/9 S. Masuzaki

Shot #: 178614-178647
(R_{ax}, B_t, γ, B_q) = (3.6 m, -2.75 T, 1.2538, 100.0%)
Working gas: H2, Seeding gas: Ne, Ar,
P_{NBI1} ~ 2 MW, P_{NBI2} ~ 1 MW, P_{NBI3} ~ 2 MW,
P_{ECH} ~ 4 MW only for start-up

Motivation: To achieve stable high radiation and divertor detachment is necessary for future fusion reactor such as DEMO. At present, Ar seeding is considered to reduce plasma temperature in DEMO. In this experiment, Ar behavior is investigated by spectroscopy, and difference of radiation profile between Ar and Ne seedings is also investigated.

Results:

- ✓ High radiation state was achieved with Ar and Ne seeding controlled by feedback using Prad signal.
- ✓ At divertor, Te decreased but that is not so large. Divertor is still attach phase. Further radiation is necessary for detachment.
- ✓ Spectroscopic data and radiation profile will be analyzed in near future.



Effect of ECH heating on impurity transport (I)

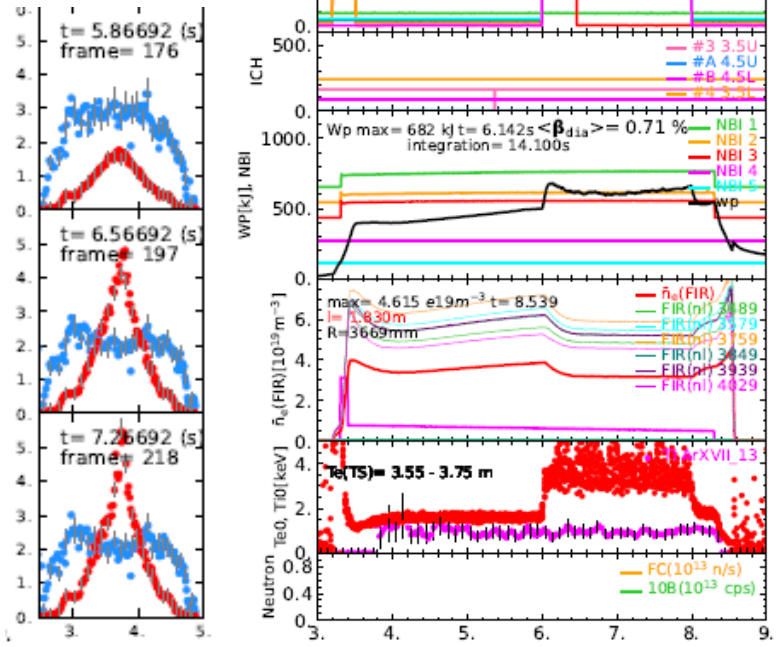
Date: Feb. 9, 2022 Time: 14:30 - 18:45 Shot#: 178651 - 178730 (80 shots)

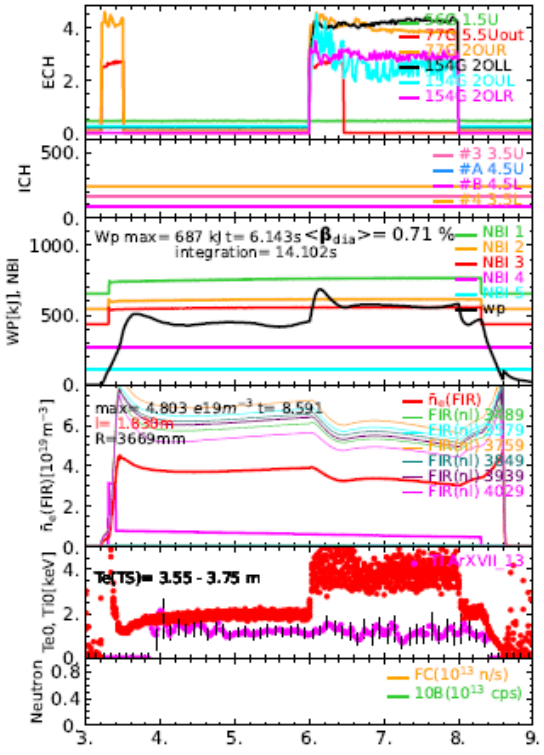
Gas puff: H2 NBI#(1, 2, 3)=gas(H, H, H)=P(~2, ~ 1, ~ 2)MW

Feb. 9, 2022
(S. Morita)

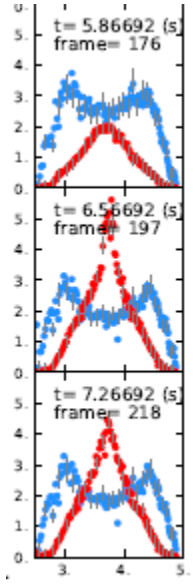
- Effect of ECH heating on the impurity transport was examined at R_{ax}=3.65m and 3.70m configurations in NBI discharges with RMP-enlarged island.
- Unfortunately, the discharges at Rax=3.70m were delicate due to probably bad wall condition, while the discharges at Rax=3.65m were successful.

#178673: with RMP
(7-O expansion
at -3300A





#178674: w/o RMP



Effect of ECH heating on impurity transport (II)

- ECH heating could reduce radiation from metallic impurities in NBI discharges, while the total radiation (Prad) was not affected by the ECH pulse.
  (Prad: total radiation, PradX: radiation at E≥0.5keV (λ≤24Å)) *secondary electron multiplier signals at 10-O
  (PradX does not include radiation from carbon impurity)
- However, in NBI discharges with RMP island, the ECH heating slightly increased the PradX.
- The present result may suggest that ECH heating changes the core metallic transport, as well as many previous results.
- The effect of ECH heating on the NBI discharges with RMP island was invisible. It seems to indicate the impurity suppression in discharges with RMP island correlates with the edge impurity transport.