(TG4) Plasma instability group report

Oct. 14, 2022 (R. Seki)

Date: Oct. 13, 2022
Time: 11:05 - 15:30
Shot#: 180334-180405 (71 shots)

Prior wall conditioning: OFF
Divertor pump: On
Gas puff: H2, Ne
Pellet: No
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(3.7,3.8,2.0,3.7, 3.0)MW
ECH(56GHz)=ant(1.5U)=P(0.288)MW
ECH(77GHz)=ant(5.5U, 2O-UR)=P(0.703, 0.792)MW
ECH(154GHz)=ant(2O-LL, 2O-UL, 2O-LR)=P(0.723, 0.799, 0.825)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(0.85, 0.85, 1.0, 0)MW
Neutron yield integrated over experiment = (7.9E+12)

Topics

1. Investigation of edge impurity transport in impurity seeded detachment combined with high beta plasma (E. Wang, M. kobayashi)
2. Mitigation of tungsten induced plasma termination and identification of transient transport mechanisms (A. Dinklage, N. Tamura)

Investigation of edge impurity transport in impurity seeded detachment combined with high beta plasma

Shot #: 180334 - 180376

Experimental conditions: (R_{ax}, B_t, γ, B_q) =

- (3.9m, 1.375T,1.2538, 100%)
- (3.9m, 1.0T, 1.2538, 100%)

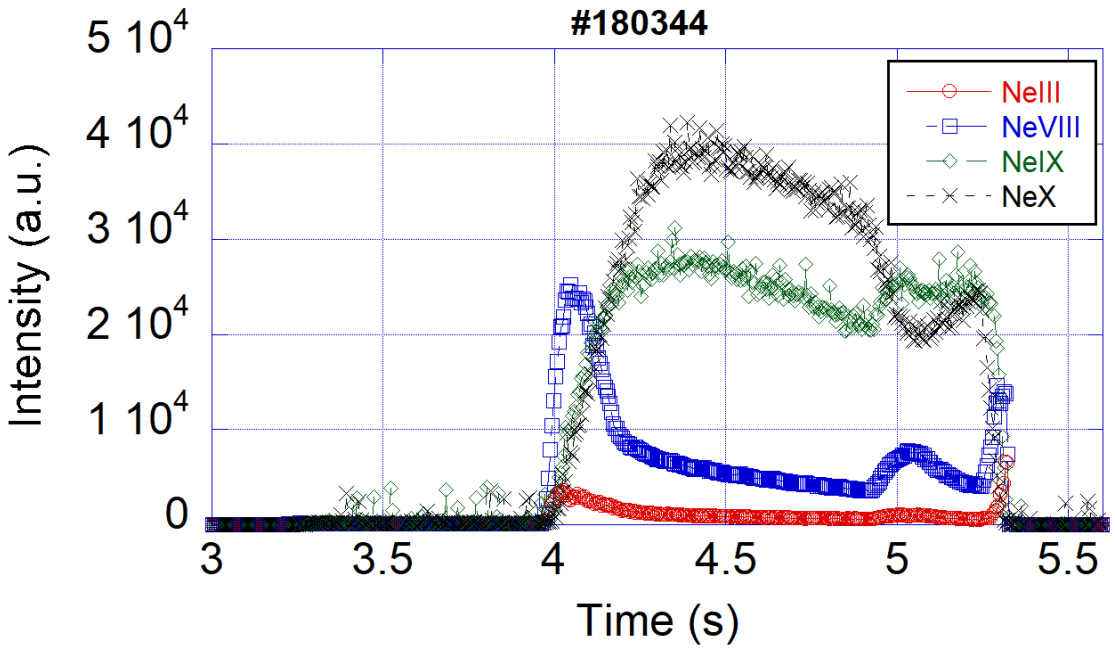
	NBI=7MW	NBI=3.5MW
Bt=1.375T	√	√
Bt=1.0T	√	×

Background and motivation: Beta effect could modify the edge magnetic topology and in further change the particle transport in the plasma boundary. In this experiment, through heating power and magnetic field scan to vary beta effect, and investigate the impurity transport behaviors, threshold and impurity screening effect in impurity seeding detachment with the simulation help.

Results: Experiments were nearly full executed except the Bt=1.0T with NBI=3.5MW;

Detachment by Neon seeding has been achieved in each condition;

Neon spatial profiles have been measured;



Research Proposal 24/002517: *Mitigation of tungsten induced plasma termination and identification of transient transport mechanisms*
Debriefing of Experiments Oct.13, 2022

A. Dinklage (IPP), N. Tamura (NIFS), H. Bouvain (IPP), R. Bussian (IPP), H. Kasahara (NIFS), K. McCarthy (CIEMAT), D. Medina (CIEMAT)

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Report on Research Proposal 24/002517 (Oct.13,2022)

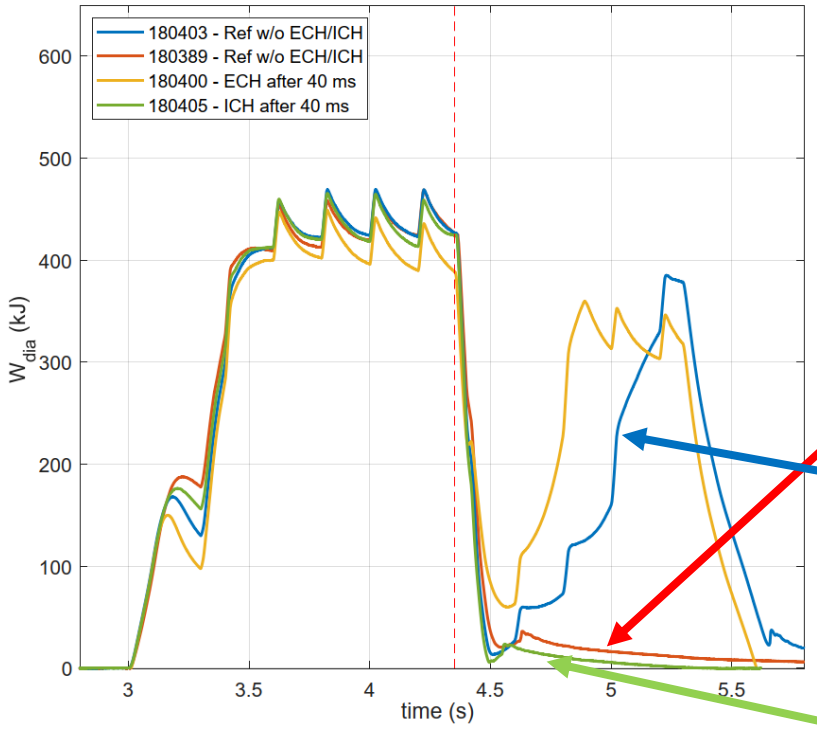
Aim of the experiment:

Investigate effect of additional heating on induced plasma termination TESPEL injection

Conducted experiments:

- shots180379-180405; ECRH (1.5 MW, 3×10^{19} m^{-3}) heated
- 14 shots w/ 3×10^{17} W TESPEL
  (Almost 100% successful delivery)
- scan of delay time of additional ECH
  (0.8 MW, Δt= 5, 10, 20, 40, 80ms)
- two delay times with ICH (2.7 MW, Δt=10, 40ms)
- Shotplan ~75% achieved (wanted more ICH cases)
- Results show clear dependencies (next slide)

Report on Research Proposal 24/002517 (Oct.13,2022)



Some findings:

- Additional heating: no plasma termination w/ 3×10^{17} W TESPEL
- Reference shows
  - plasma termination with a continued gas puff (180389)
  - no plasma termination w/o a continued gas puff (180403)
- delay time of add. ECH has a small impact
- Δt = 40ms ICH: plasma terminated

Additional (‚rescue‘) heating mitigates the plasma termination by massive impurity injection