

# (TG4) Plasma instability group report



Oct. 4, 2022 (Y. Takemura)

Date: Sep. 30, 2022

Time: 15:40 - 18:45

Shot#: 179432-178439, 179479 –179537 (67shots)

Prior wall conditioning: Off

Divertor pump: Off

Gas puff: H<sub>2</sub>, Pellet: No

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(3.7, 3.3, 0.0, 0.0, 4.1)MW

ECH(56GHz)=ant(1.5-U)=P(0.0, 0.0)MW

ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.33, 0.37)MW

ECH(154GHz)=ant(2-OLL, 2-OUL, 2O-LR)=P(0, 0, 0)MW

ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(0, 0, 0, 0)MW

Neutron yield integrated over experiment = (4.9E+12)

## Topics

1. p-B11 Detector Test (TAE group, S. Ohdachi)
2. The radiation enhancement and triggering the island divertor detachment by direct supply of BN powders into the magnetic island in the LHD peripheral plasma using the IPD (M. Shoji)

# p-B11 Detector Test S.Ohdachi/H. Gota NIFS/TAE

Shot #: 179432-178439

Experimental conditions:

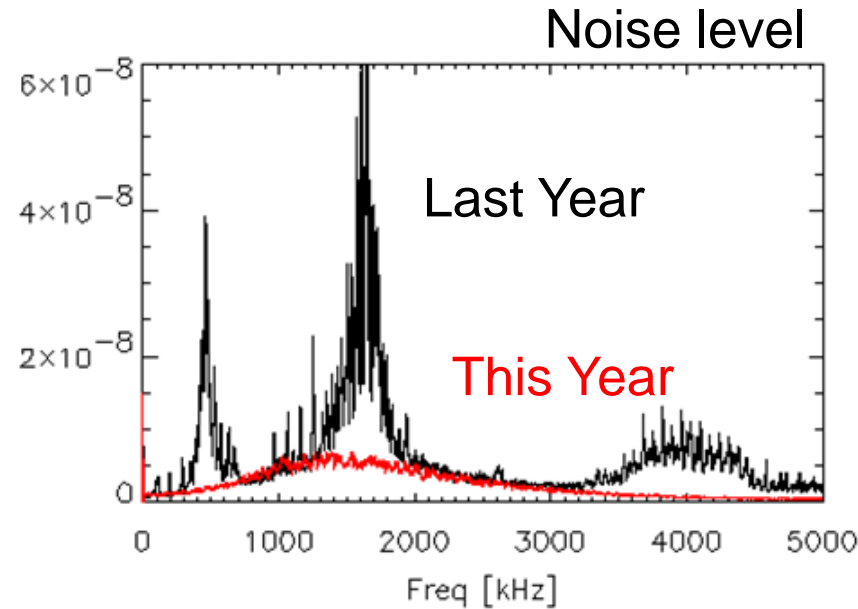
$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.6 \text{ m}, \text{CCW}, 2.75\text{T}, 100 \%)$

Background and motivation:

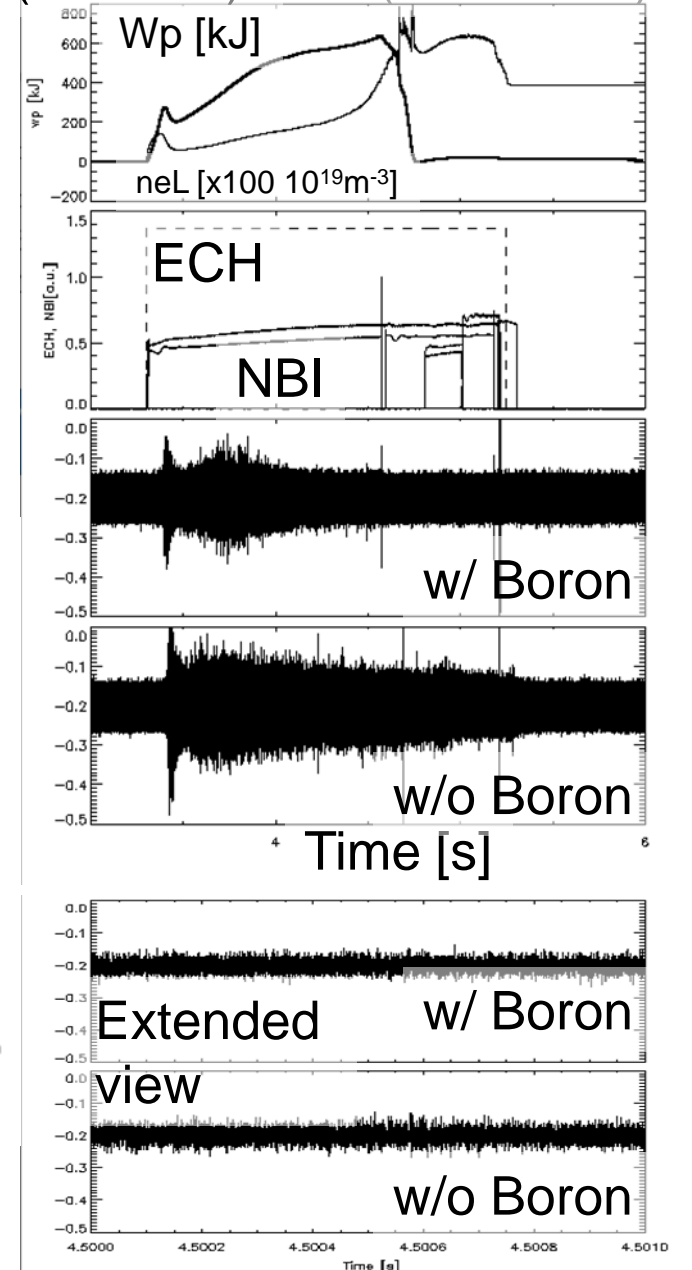
- Detection of the alpha particle produced by Proton-Boron11 fusion reaction ( $^{11}\text{B}(p, \alpha)2\alpha$ ) is performed. Detector system has been improved (Shielded cables, W cover) in this campaign.

Results:

- Noise level without plasma is reduced from 0.25V to 0.15V.
- Pick-up noise caused by ECH, NBI #4 and #5 is disappeared.
- In the condition of Sep. 30<sup>th</sup>, alpha articles produced by the pB11 reaction have not been detected.



179438 (w Boron) / 439 (w/o Boron)



# The radiation enhancement and triggering the island divertor detachment by direct supply of BN powders into the magnetic island in the LHD peripheral plasma using the IPD (M. Shoji)

Shot No: #179479-#179537 (30 Sept. 2022)

## Experimental conditions:

$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.85 \text{ m}, \text{CCW}, 1.375 \text{ T}, 1.2538, 100.0 \%)$ , H plasma, IPD: BN Powder,  $d=60 \mu\text{m}$  (2.5-4.5 s), NBI: #1, #2, #5 (duration is 2 s), RMP(1920A  $\rightarrow$  3300 A  $\rightarrow$  3000 A),  $n_{e, \text{bar}}=3 \sim 6E+19 \text{ m}^{-3}$

## Background and motivation:

- Triggering the island detachment by supplying BN powders into the magnetic island using the IPD
- Demonstration of advantages using the IPD for sustaining the divertor detachment

## Preliminary results:

- No divertor detachment and no indication of the magnetic island formation was observed on the electron temperature profile for the small magnetic island configuration (1920A) (- #179519).
- Divertor detachment was observed for the large magnetic island configuration (3000-3300 A) (#179520 -).
- BN powder drop enhanced  $P_{\text{rad}}$  and CIII intensity (indication of the divertor detachment).

