

(TG4) Plasma instability group report

Oct. 22, 2021 (Y. Takemura)

Date: Oct. 21, 2021

Time: 15:40 - 18:45

Shot#: 170728 – 170780 (53 shots)

Prior wall conditioning: None

Divertor pump: On

Gas puff: H₂, Pellet: No

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(3.5, 4.0, 3.9, 3.4, 3.1)MW

ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.70, 0.79)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 = 5.6×10^{10}

Topics

1. MHD instability suppression by RMP field (S. Ito)
2. Sawtooth-like oscillation in high aspect ratio configuration of LHD (Y. Takemura)

MHD instability suppression by RMP field (S. Ito)

Shot #: 170728-170750

Experimental conditions:

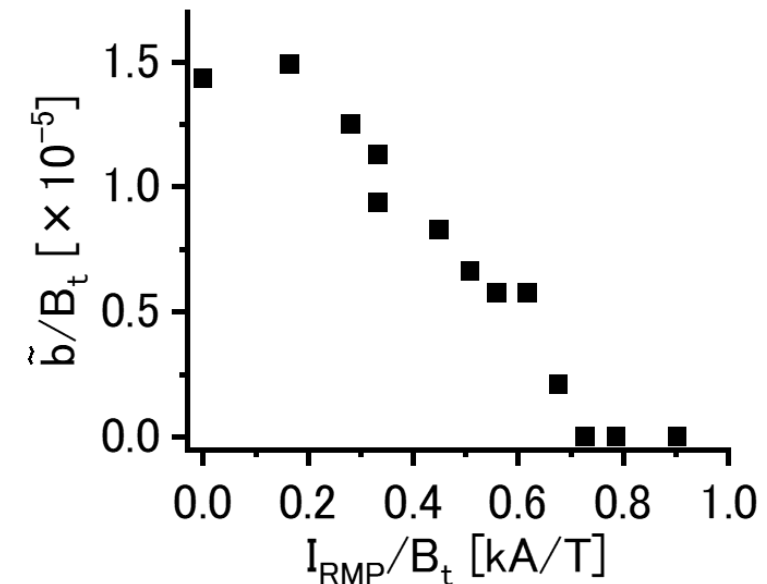
$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.75 \text{ m}, \text{CW}, 1.375 \text{ T}, 1.2538, 100 \%)$

Background and motivation:

- We want to investigate how the RMP thresholds which can completely suppress instability depend on experimental condition such as β -value, mag. fluc. Amplitude and/or mag. field strength without external RMP.
- We conduct the applying RMP experiments fixing an operational mag. field strength (1.375T) and changing the heating power and the operational density.

Results:

- We can get a result with a heating and density condition.
- As RMP coil current increases, coherent $m/n=1/1$ mag. fluc. amplitude decreases monotonically.
- So under this experimental condition, complete instability suppression threshold of external RMP without RMP penetration is about 0.72kA/T.



Sawtooth-like oscillation in high aspect ratio configuration of LHD (Y. Takemura)

Shot #: 170751-170780

Experimental conditions:

$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.60 \text{ m}, \text{CW}, 0.75 \text{ T}, 1.129, 100 \%)$

Background and motivation:

- In the cntr-NBI heated plasmas with the high aspect ratio configuration ($\gamma = 1.13$), the sawtooth-like oscillation is observed.
- Identify experimental condition where the oscillation appears to understand the onset (NBI power and $n_e \dots$).
- Investigate the relationship between the sawtooth-like oscillation and the mode activity.

Results:

- The oscillation in beta and n_{e_bar} signals is not observed in low n_e region.
- n_e increases in core region, but it decreases in edge region.
 - Inversion in n_e profile is located at $i/2\pi \sim 1$.
- At the crash, $m = 1$ magnetic fluctuation rapidly grows.

