

Daily Report for 2025-12-04

H. Takahashi

Date: December 4, 2025

Time: 9:30 – 17:15

Shot: 198534 – 198659 (126 shots)

Prior wall conditioning: No

Divertor pump: On

Gas puff: H₂, He

Pellet: No

NBI: #1, #2, #3, #4, #5

ECH: 2-OUR (77GHz), 5.5-UO (77GHz), 2-OUL (154GHz) , 2-OLL (154GHz)

ICH: No injection

Topics

1. Core MHD instability suppression by RMP field (K. Watanabe)
2. Demonstration of external control of energetic ion confinement with AEs and EP measurement (K. Nagaoka)
3. Effect of pre-damage on hydrogen/helium mixed plasma induced tungsten surface modifications at divertor (M. Zhao)

Core MHD Instability suppression by Ext.-RMP (K.Y.Watanabe)

Background and motivation:

$m/n=1/1$ resistive interchange insta. can be suppressed by external RMP.

- typical MHD in the peripheral regions of LHD plasmas –

? Is the Instability in core – $m/n=2/1$ interchange insta. suppressed by ext. RMP ???

- resistive effect on $m/n=2/1$ insta. is smaller than that on $m/n=1/1$ insta. the magnetic Reynolds number S of core is higher than peripheral ones.

Approach:

For the discharges with $m/n=2/1$ MHD mag. fluct., $m/n=2/1$ RMP is imposed by ext. coils, and the response of $m/n=2/1$ fluct. is investigated.

Experimental conditions:

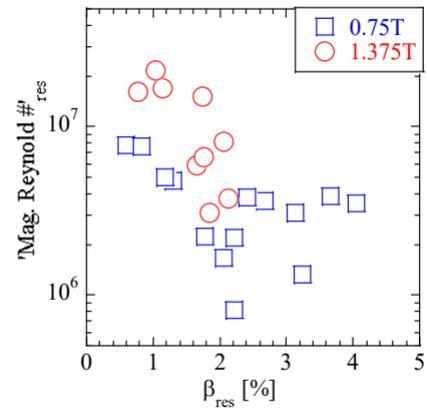
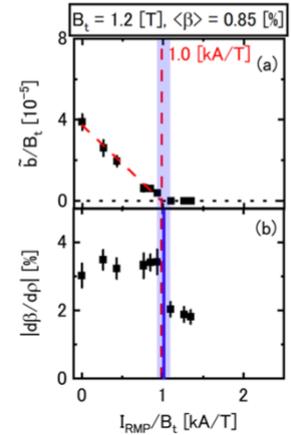
$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.55\text{m}, \text{CCW}, 0.75\text{T}/1.375\text{T}, 1.2538, 100\%);$

#198537-58(0.75T)[37-40; MSE-Calib.], 198561-71(1.375T)

Results:

We obtain the discharges with 1~4 % as the beta value and $5 \times 10^{5-7}$ as Mag. Reynold # at the resonant surf. However, we could not find the clear $m/n=2/1$ MHD fluct. with the high coherence during the experiments though some fluct. with kHz order frequency and relatively large amplitude. Because we often observe $m/n=2/1$ fluct. in the same magnetic config. with almost same beta and collisionality, now we are investigating why the clear $m/n=2/1$ MHD fluct. is not observed.

$m/n=1/1$ RIC suppression by RMP



Demonstration of External control of energetic ion confinement

with AEs and EP measurement

K. Nagaoka and M. Matsuoka (Nagoya Univ.)

Experimental conditions:

$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.9\text{m}, \text{CCW}, -1.375\text{ T}, 1.2538, 100.0\%)$ #198580 - #198615

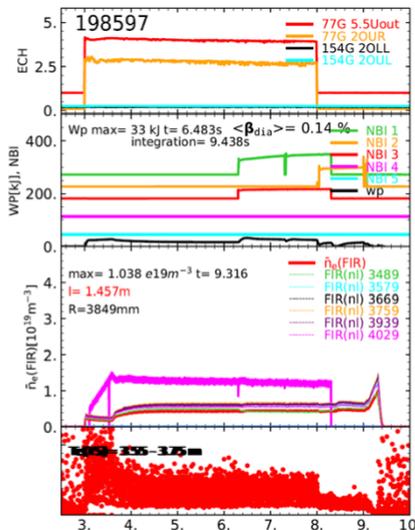
$(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.65\text{m}, \text{CCW}, -0.5\text{ T}, 1.2538, 100.0\%)$ #198616 - #198634

Motivation and method:

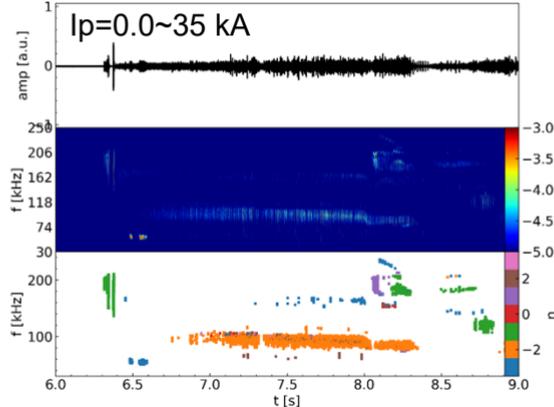
- Clarification of the elemental process of the change of EP confinement
- Measurement of fast ions by Si-NPA and FILD

Results:

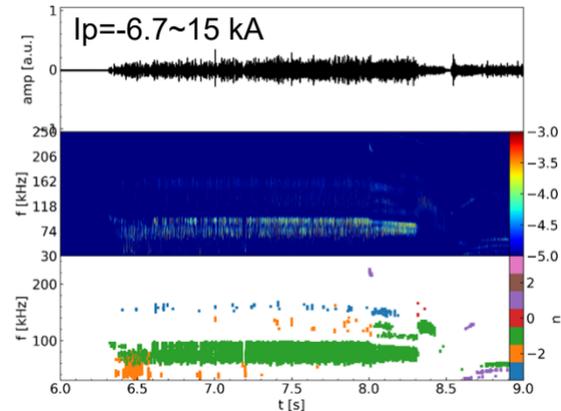
- Type of AEs depended on ECCD direction but Mitigation of AEs was not clear
- NPA and FILD worked well
- AE with $n=0$ was reproduced ($B=0.5\text{T}$ e.g. 198629 not shown here)



198597 Co-ECCD



198605 Ctr-ECCD



Effect of pre-damage on H/He mixed plasma induced tungsten surface modifications at divertor

M. Zhao, S. Masuzaki and G. Motojima

Experimental conditions:

(R_{ax} , Polarity, B_t , γ , B_q) = (3.6 m, CCW, 2.75 T, 1.254, 100.0%)

He ratio adjustment: #198635 - #198638

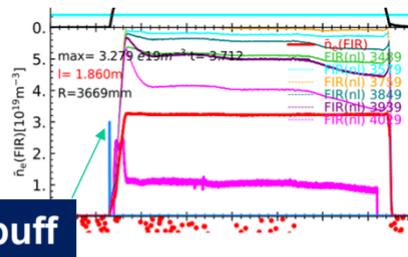
ITER W exposure at divertor leg position: #198639 - #198658

Motivation and method:

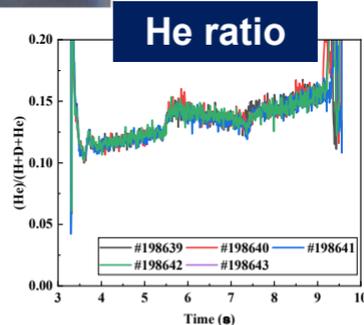
- To clarify the W surface modifications as well as the pre-damaged effect under H/10%He mixed plasma exposure at divertor position.
- The mirror finished ITER grade W and pre-He plasma damaged W were exposed to H/10%He mixed plasma at LHD divertor leg position.
- He ratio was controlled by the He puffing.

Results:

- The measured temperature is below the W recrystallization temperature.
- The surface modifications of W will be analyzed by SEM and TEM.



He puff



He ratio

Max temperature: 374 °C

