(IA) Instability & Anisotropy Session report

Apr. 5, 2024 (Y. Takemura)

Date: Apr. 4, 2024
Time: 10:30 - 14:18
Shot#: 188877-188945 (69 shots)

Prior wall conditioning: None, Divertor pump: Off
Gas puff: H2, Pellet: H2,Ne

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(4.7, 4.2, 3.8, 3.7, 5.0)MW
ECH(56GHz)=ant(1.5-U)=P(-)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(0.72, 0.80, 0.83)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -)MW

Topics

1. Spatiotemporal structure of local and global disturbance triggered by high Z (neon) doped hydrogen pellet injection (A. Matsuyama (Kyoto Univ., R. Sakamoto)
2. Stabilizing mechanism of MHD instability with island in relatively high density regime (Y. Takemura)

Spatiotemporal structure of local and global disturbance triggered by high Z (neon) doped hydrogen pellet injection

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R. Sakamoto (NIFS) Y. Takemura (NIFS)
G. Motojima (NIFS) M. Goto (NIFS)
N. Panadero (CIEMAT) [Piggyback]

Objectives:

➢ Understanding of pellet ablation mechanisms and dynamics of high-density structure produced by pellet injection

Experimental condition:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.2538, 100.0%)
#188877 - #188905 (29 shots)

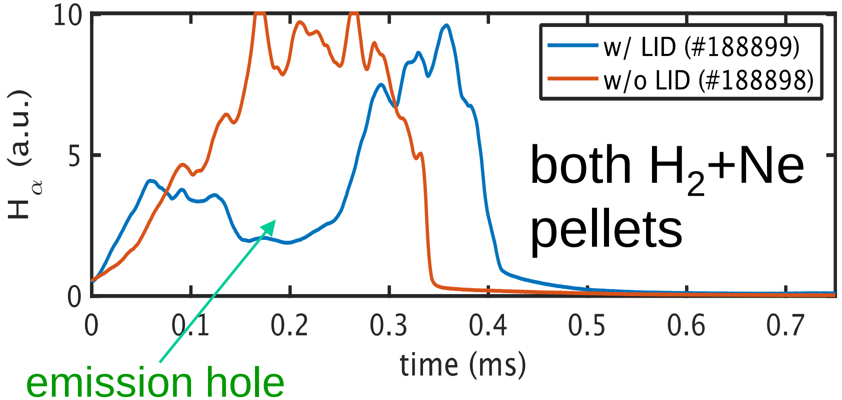
Results (April 4th)

➢ Pellets were injected into the target plasmas (1 - 2 x $10^{19}m^{-3}$) sustained by ECH and NBI alone

- Dataset of March 29th was extended to higher density (> 1e19m-3) and for 3.4 mm 5% Ne doped pellets
- Fast Thomson scattering: ~ 3 shots success (only for Ne)
- Divertor probe signals will be compared bet. CW/CCW polarities.

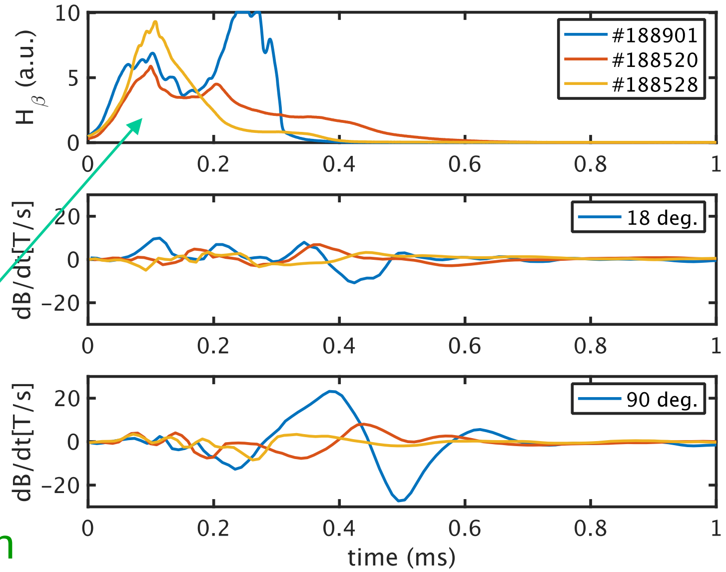
➢ High density structure produced by the pellet was controlled by imposing 1/1 magnetic island near the ablation region

- Emission hole was observed for both pure H_2 and H_2+Ne pellets
- We found that coherent magnetic disturbance (maybe, n=1) is yielded when the pellet crosses m/n = 1/1 island



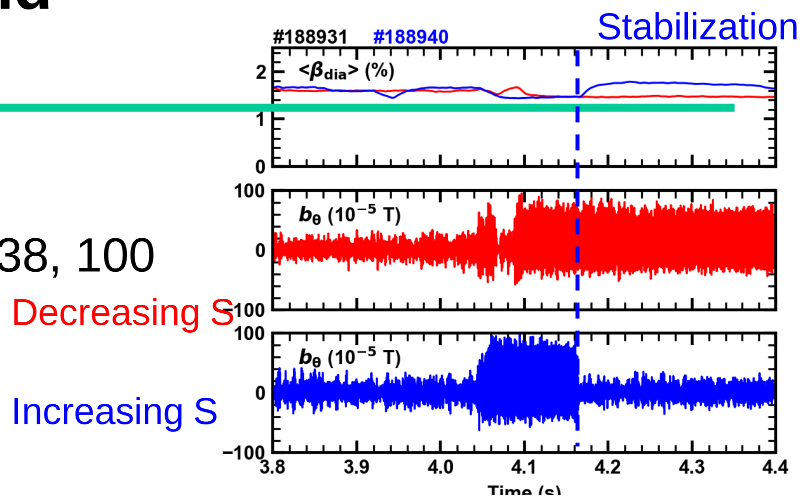
emission hole observed

pure H_2 pellet data



penetration varied across islands with n_e scan

Stabilizing mechanism of MHD instability with island in relatively high density regime (Y. Takemura)



Shot #:188909-188945

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = 3.75, CCW, 0.75, 1.2538, 100

Background and motivation:

- Investigate the stabilizing mechanism of Edge instability which is an instability with a magnetic island observed in relatively high-density regions of the LHD
- Previous results show that the onset condition is determined by beta value and local magnetic Reynolds number (*S*)
- Conducted experiments to change beta and *S* parameters after the instability onset using gas puffs, as they may also be related to mode stabilization

Results:

- Stabilization did not occur in discharges where *S* decreased
- Stabilization occurs when the increased *S* exceeds a certain threshold value
- The role of *S* in stabilization remains a subject for future investigation