(SG3) Instability & Anisotropy (IA) Session Report

April. 25, 2024 (N. Kenmochi)

Date: April 24, 2024
Time: 10:30 - 16:45
Shot#: #190126 – #190239 (114 shots)

Prior wall conditioning: He
Divertor pump: ON
Gas puff: H2

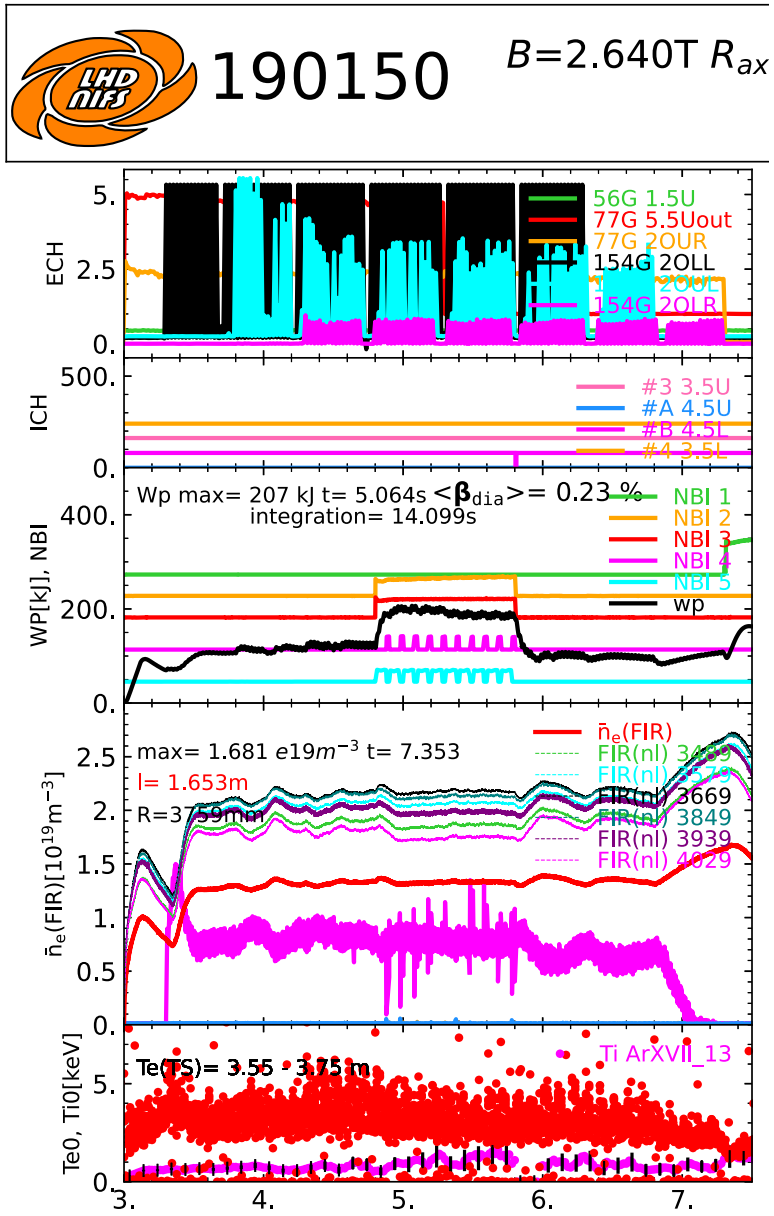
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(4.6, 4.3, 4.0, 3.1, 3.2)MW
ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(698, 380)kW
ECH(154GHz)=ant(2-OLL, 2-OUL , 2-OLR)=P(705, 889, 982)kW
ECH(56GHz)=ant(1.5U)=P(-)kW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0.0, 0.0, 0.0, 0.0)MW

Topics

1. Investigation of turbulence spreading phenomena by gradient scan experiments (N. Kenmochi)
2. Impact of enhanced stochastization in outward-shifted configuration on the detachment density threshold(A. Knieps, Y. Takemura)
3. Stabilization of intrinsic detachment in high-beta operation(A. Knieps (FZJ), Y. Takemura)

Investigation of turbulence spreading phenomena by gradient scan experiments

(N. Kenmochi)

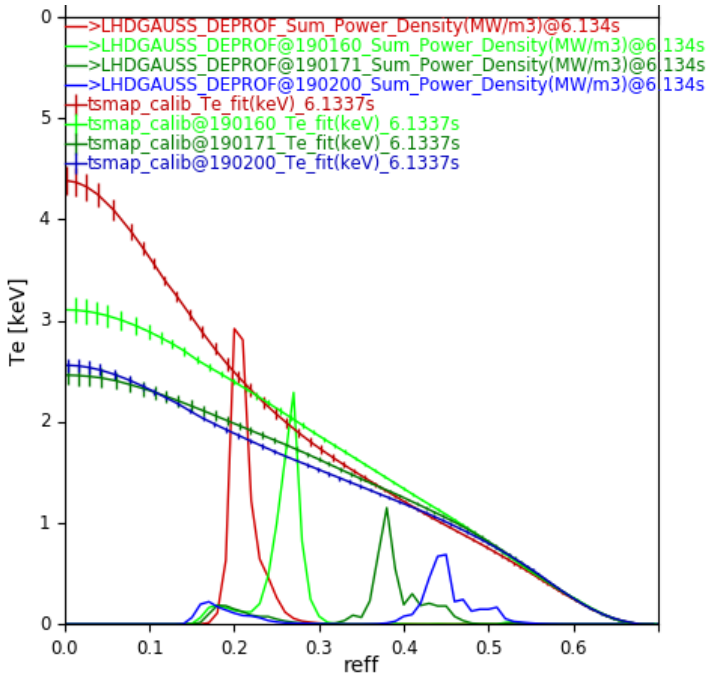


Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CW, 2.64 T, 1.2538, 100.0%)
(#190126 - #190209)

Objective:

To elucidate the mechanism of turbulence spreading phenomena by investigating the relationship between temperature gradient and turbulence intensity in detail.



Results:

- ✓ Temperature gradient and turbulence intensity profiles have been measured in MECH experiments with varying absorption position (r/a=0.25-0.72), and absorption power (0.7-2.5MW) to investigate the relationship between them.
- ✓ Positional scan data of both BS and HIBP measurements have also been successfully taken.
- ✓ The relationship between temperature gradient and turbulence intensity will be investigated.

Stabilization of detached state in high-beta plasmas

(A. Knieps)

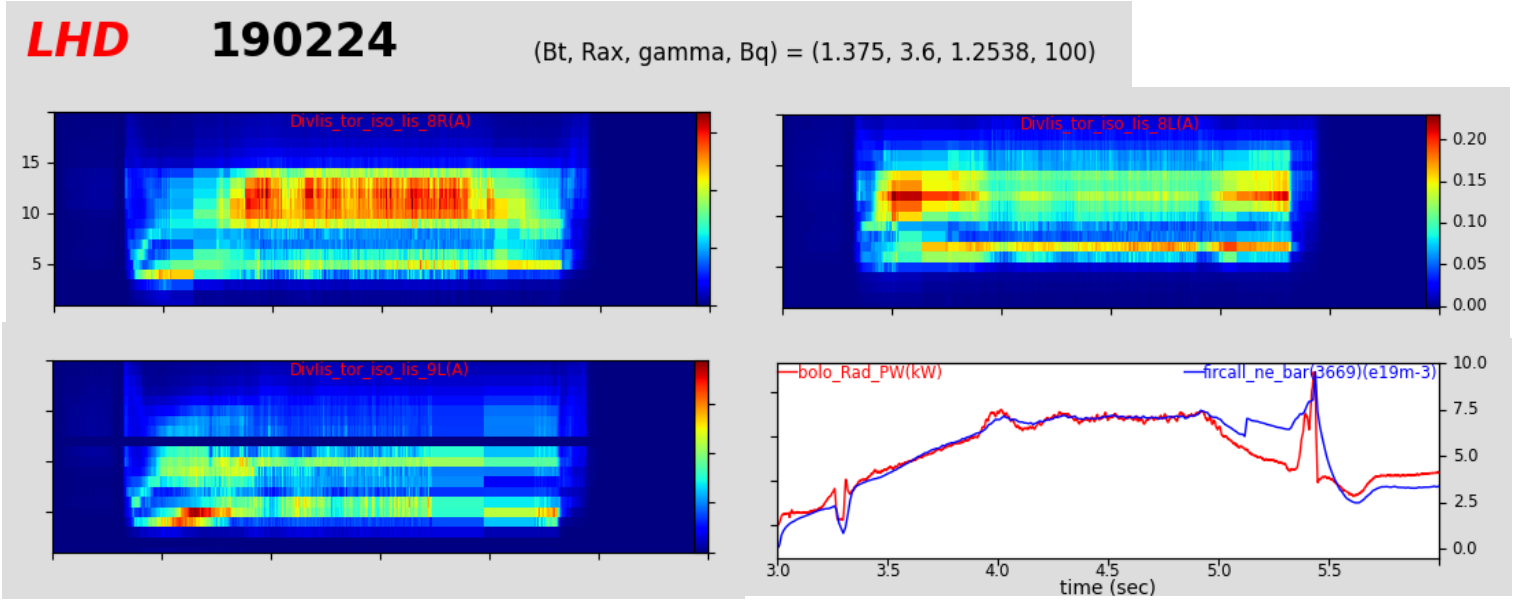
Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 1.375 T, 1.2538, 100.0%)(# 190210 - #190226)

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 1.000 T, 1.2538, 100.0%)(# 190230 - #190233)

Objective:

Attempt to stabilize detachment by holding / slowly ramping density near detachment threshold in high-beta plasmas.



Results:

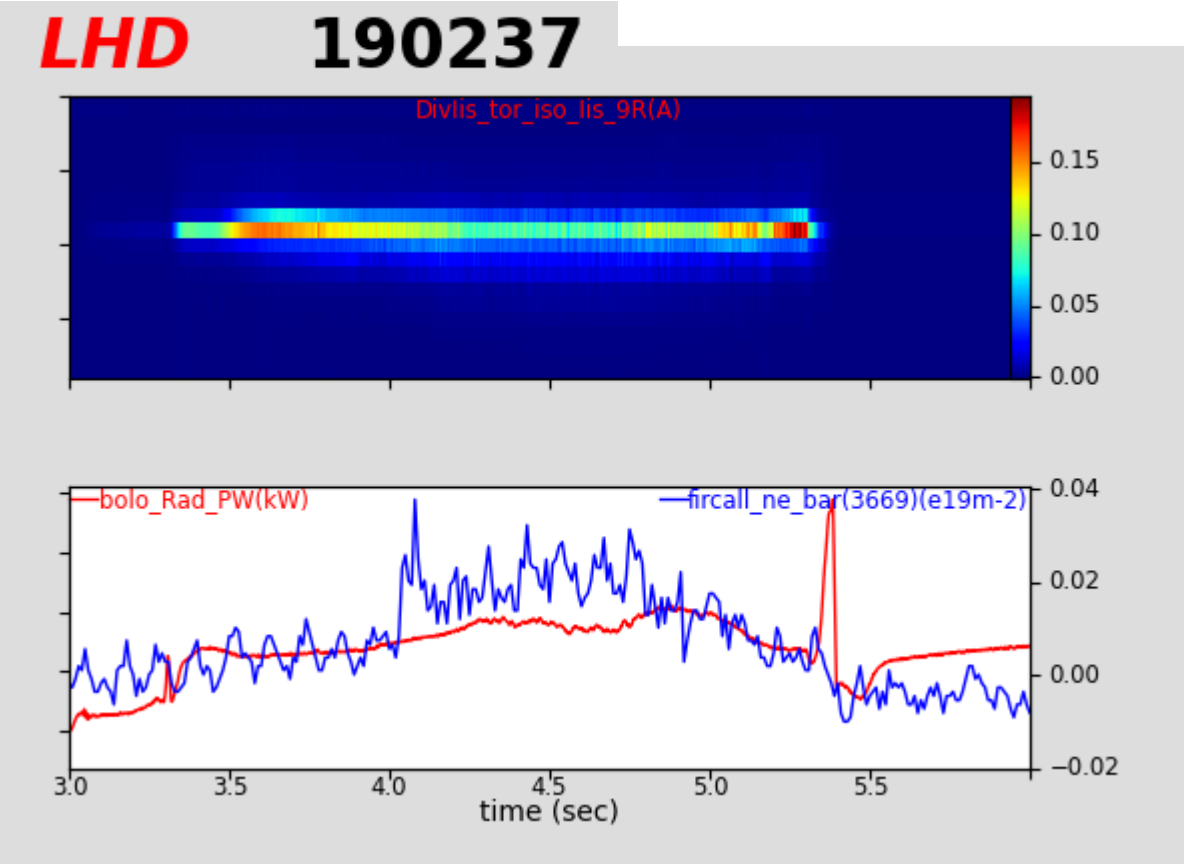
- Detachment could be partially sustained. On some divertors, particle flux detachment was observable, but not all divertors could detach stably.
- Near threshold, density feedback control became difficult.

Intrinsic threshold for detachment in outward-shifted configuration (3.9m)

(A. Knieps)

Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.9 m, CW, 1.375 T, 1.2538, 100.0%)(# 190235 - #190238)

Objective:
Assess detachment threshold in high- and low-beta scenarios in outward-shifted configuration to compare stochastic outward-shifted configuration with high-beta 3.6m case



Results:

- Particle flux detachment (specifically, strong Isat reduction in divertor Langmuir probes) could be reached
- Heat flux detachment (substantial Prad increase) was apparently not realized
- Attempts to reach radiative collapse not realized (startup failure in last shots)