(TG2) Turbulence Topical Group Report

Dec. 14, 2021 (T. Kobayashi)

Date: Dec. 10, 2021
Time: 9:50 – 13:20
Shot#: 174769 – 174837 (69 shots)

Prior wall conditioning: None
Divertor pump: On except for 2-I
Gas puff: D_2
Pellet: None

NBI#(1, 2, 3, 4, 5) = gas(D, D, D, D, D) = P(2.3, 1.9, 2.8, 4.8, 4.4) MW

ECH(77 GHz) = ant(5.5-Uout (or 1.5U), 2-OUR) = P(333, 365) kW
ECH(154 GHz) = ant(2-OLL, 2-OUL , 2-OLR) = P(296, 364, 343) kW
ECH(56 GHz) = ant(1.5U) = P(-) kW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(0.84, 0.58, 0.78, 0.42) MW
Neutron yield integrated over the experiment = 1.4×10^{17}

Topics

1. Direct measurement of ion heat flux by radial CXS view (T. Kobayash)
2. Turbulence suppression with impurity powder dropper (F. Nespoli and S. Masuzaki)

Direct measurement of ion heat flux by radial CXS view

T. Kobayashi

Shot #: 174769 - 174808

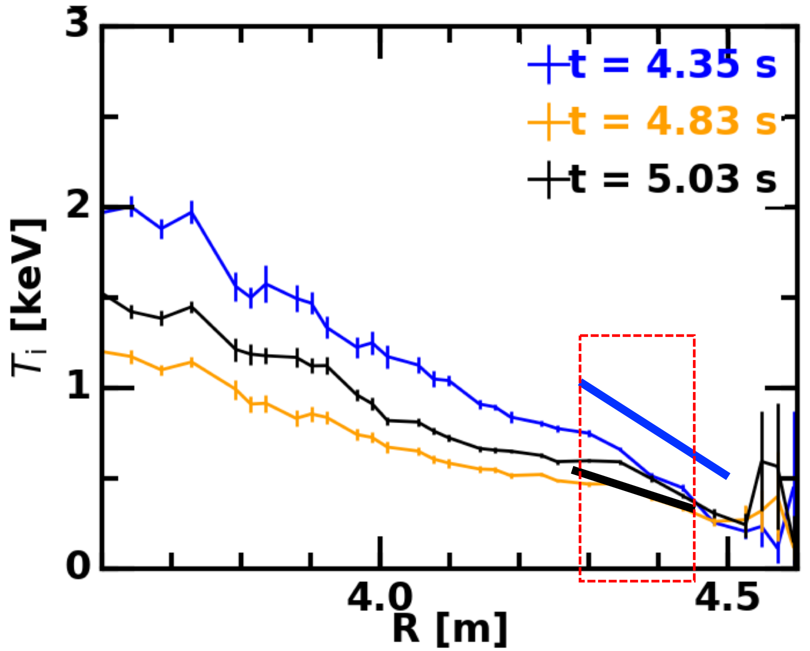
Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CW, 2.79 T, 1.2538, 100 %)

Motivation

- Using the radial-poloidal lines of sight of LHD CXS, radial velocity distribution function can be obtained.
- By taking the third order moment, the heat flux is directly evaluated, which is subject to be compared to the power balance/dynamic heat flux.
- Apparent velocity appears due to the atomic process, which is proportional to the ion temperature.
- Modulating heat flux without changing local ion temperature is aimed.

What we did

- RMP field was applied to modulate the temperature gradient.
- To observe various plasma response, the RMP field strength and the NBI torque were scanned.
- Modulation ECH was applied to analyze the island structure
- Time slices with different temperature gradient and same temperature were obtained.

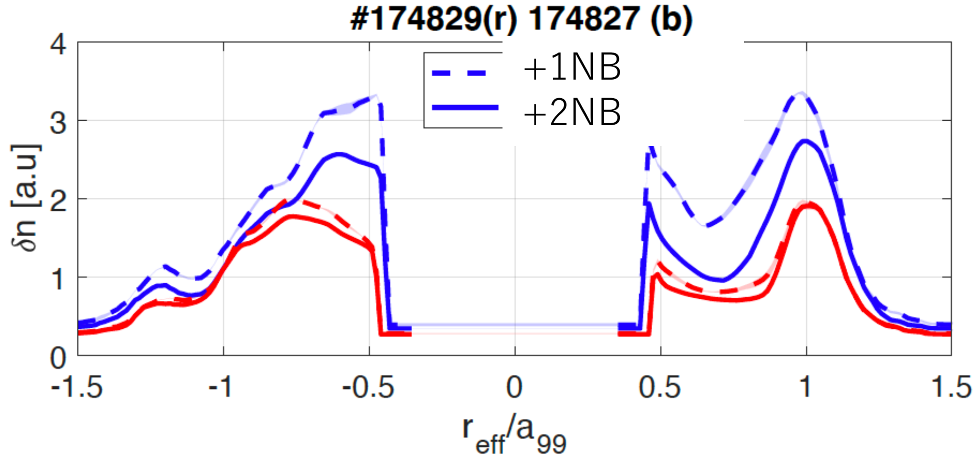


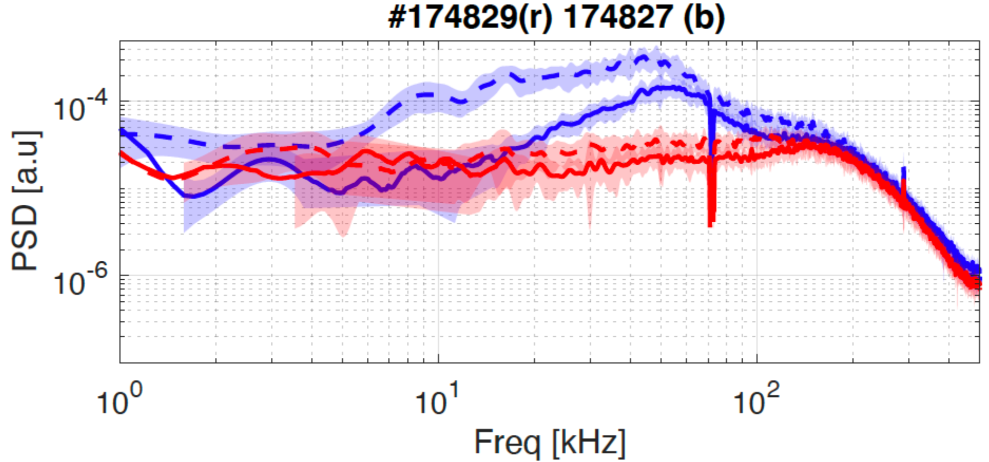
Turbulence suppression with impurity powder dropper

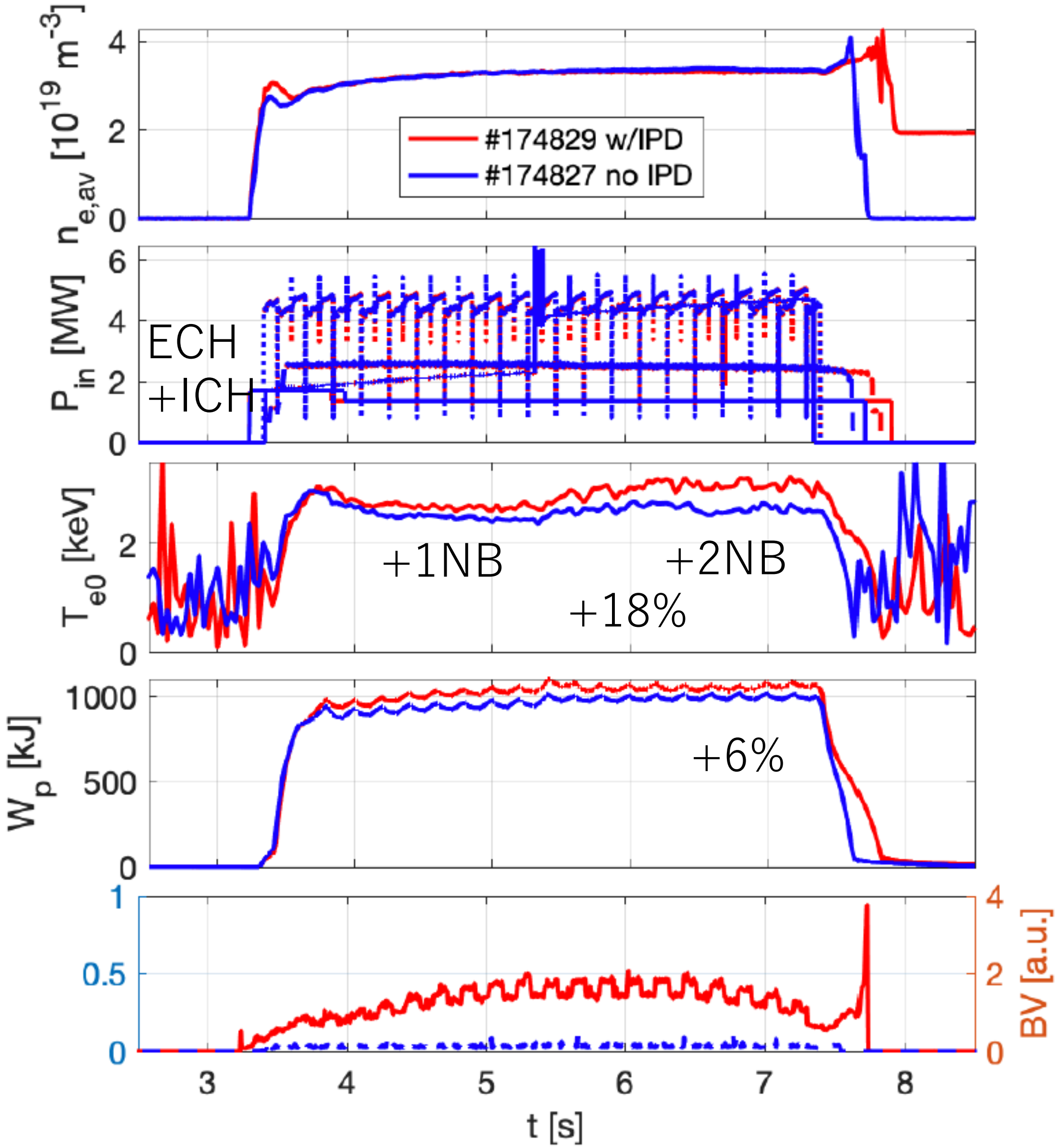
F. Nespoli et al.

2021.12.10 R_{ax}=3.55m

- B powder injected in plasmas with different levels of heating ECH+ICH, +1NB, +2NB, +3NB
- Reduction of turbulence and increase of temperature observed clearly in one case, otherwise increase of







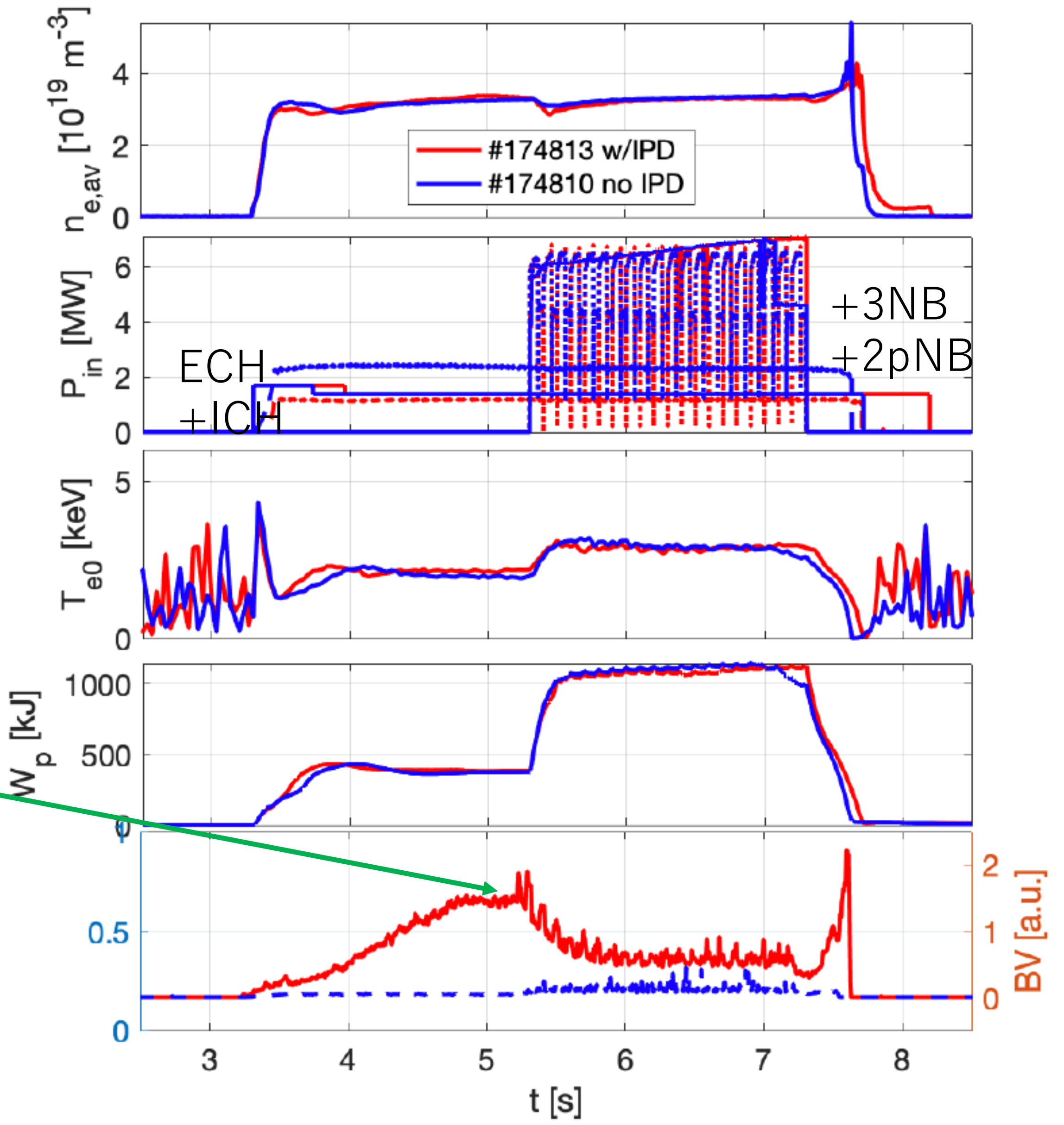
Turbulence suppression with impurity powder dropper

F. Nespoli et al.

2021.12.10 R_{ax}=3.55m

- B powder injected in plasmas with different levels of heating ECH+ICH, +1NB, +2NB, +3NB
- Reduction of turbulence and increase of temperature observed clearly in one case, otherwise increase of temperature not so clear

- Lower penetration of powder in the plasma in Rax=3.55m with respect to 3.6 m? EMC3-DUSTT simulations needed
- BV line decreases when NBs turn on, B flushed out of the plasma/ change in B powder penetration? Change in B powder assimilation suggested by visible camera images



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