(TG2) Turbulence Topical Group Report

Nov. 29, 2022 (T. Tokuzawa)

Date: Nov. 25, 2022
Time: 15:30 - 18:45
Shot#: 184498 – 184558 (61 shots)

Prior wall conditioning: None
Divertor pump: OFF
Gas puff: D2, He, Ar
Pellet: None IPD: None
NBI#(1, 2, 3, 4, 5)=gas(D, D, D, D, D)=P(2.0, 2.2, 0.7, 6.5, 8.2)MW

ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(703, -)kW
ECH(154GHz)=ant(2-OLL, 2-OUL , 2-OLR)=P(723, 799, 986)kW
ECH(56GHz)=ant(1.5U)=P(-)kW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(-, -, -, -)MW
Neutron yield integrated over the experiment = 3.0 x10^{16}

Remarks

Trouble with sample driving system (#184498-#184499)

Topics

1. Investigation of ETG turbulence threshold (T. Nasu, T. Tokuzawa)

Investigation of ETG turbulence threshold in LHD
(T. Nasu, T. Tokuzawa, M. Nakata)

Shot #: 184500 - 184558

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100 %)

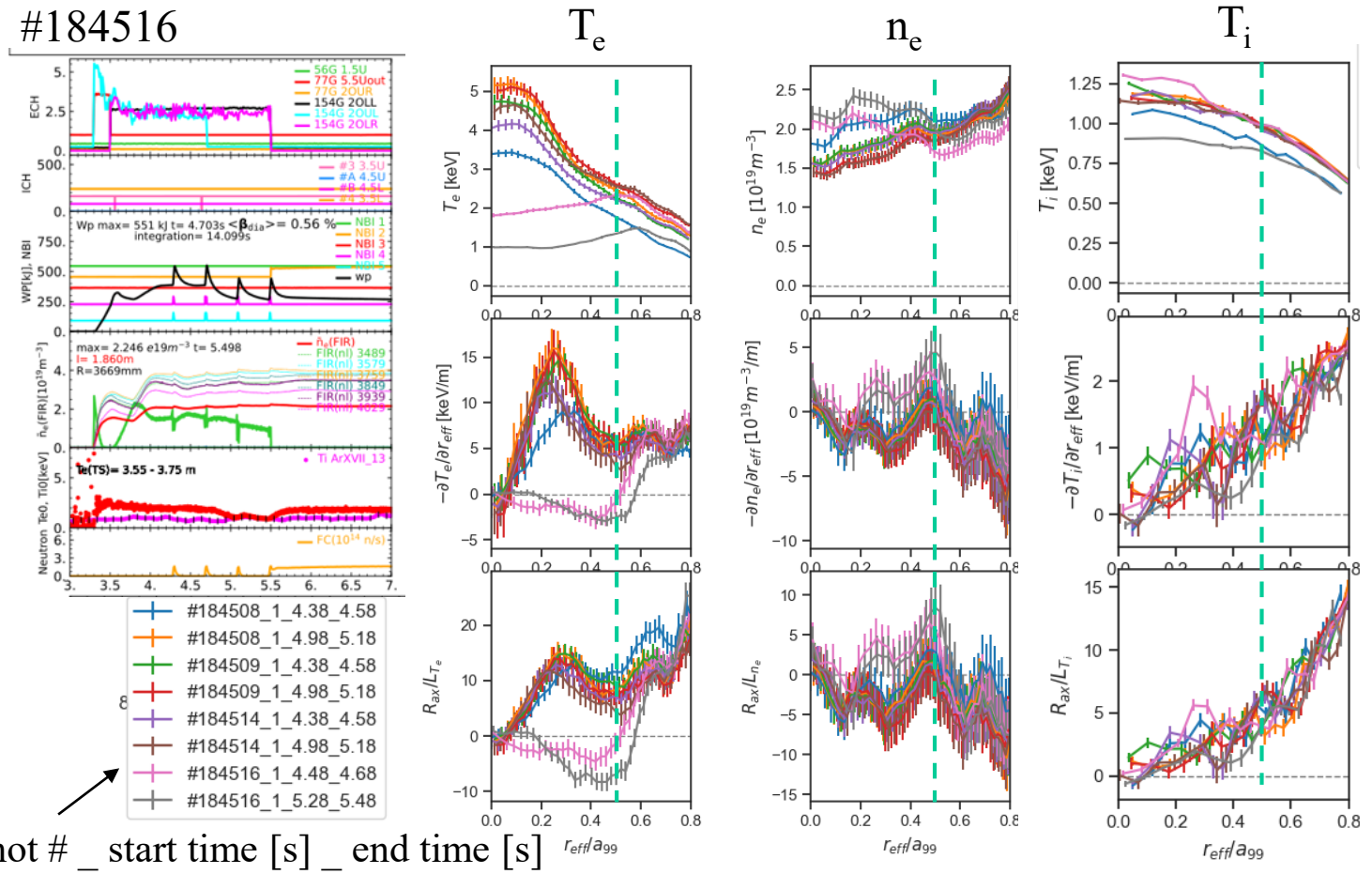
Motivation and objective: To investigate electron-scale turbulence with sweeping R_{ax}/L_{Te}, T_e/T_i, R_{ax}/L_{ne}, and Z_{eff}, which contribute growth rate of ETG instability. It is expected for ETG instability, when R_{ax}/L_{Te} exceeds a threshold, ETG instability is destabilized rapidly. We also aim to investigate dependence of the threshold on the above parameters.

Method:

- To control T_e profile needed to calculate R_{ax}/L_{Te} and T_e/T_i, power and deposition point of off-axis ECH was controlled.
- To control n_e profile needed to calculate R_{ax}/L_{ne}, we switched injected NBI. Using NBI #1, #2, and #5 changed ne profiles from hollow to peak.
- To control Z_{eff} temporally, we provided He on the middle of discharges.

Results:

➢ Both of ∇T_e control under constant T_e and T_e control under constant ∇T_e was achieved at r_{eff}/a_{99}~0.5 and intensities of electron-scale turbulence were obtained at the position for two different direction.



Results:

- Intensities of electron-scale turbulences
  - increased with increasing ∇T_e under constant T_e.
  - decreased with increasing T_e under constant ∇T_e.

➢ The above qualitative characters are consistent with ETG turbulence characters.

➢ In addition, we could see thresholds at – dT_e/dr_{eff} ~ 5 keV/m.

⇒ We will check dependences of the turbulence intensities on the other parameters and phase velocity and background flow velocity at this spatial position.