(TG2) Turbulence Topical Group Report

Dec. 21, 2022 (A. Shimizu)

Date: Dec. 20, 2022
Time: 9:34 - 11:52, 14:46-18:43
Shot#: #186505 – #186547 (43 shots)
#186599 – #186668 (70 shots)

Prior wall conditioning: NO
Divertor pump: ON
Gas puff: H2
IPD: ON
NBI#(1, 2, 3, 4, 5)=gas(None, H, H, H, H)=P(None, 2.0, 2.0, 3.8, 3.4)MW
ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(703, None)kW
ECH(154GHz)=ant(2-OLL, 2-OUL , 2-OLR)=P(463, 484, 482)kW
ECH(56GHz)=ant(1.5U)=P(-)kW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0.69, 0.63, 0.73, 0.74)MW
Neutron yield integrated over the experiment = 4.3 x10^{13}

Topics

1. 2D structure measurements of GAM eigenmode (T. Tokuzawa)
2. Effect of injection of different powder materials on plasma turbulence and performance (F. Nespoli (PPPL), S. Masuzaki)
3. Plasma control using turbulence level (H. Sakai (Kyushu Univ.), K. Tanaka, T. Kinoshita)

2D structure measurements of GAM eigenmode (T. Tokuzawa)

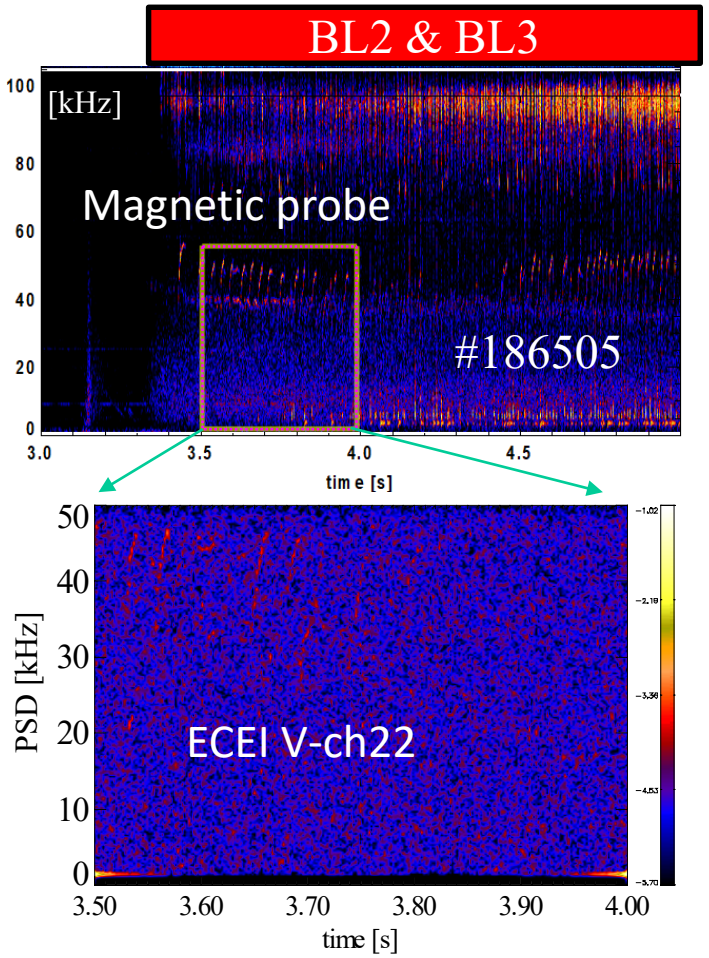
Shot #: 186505 - 186547

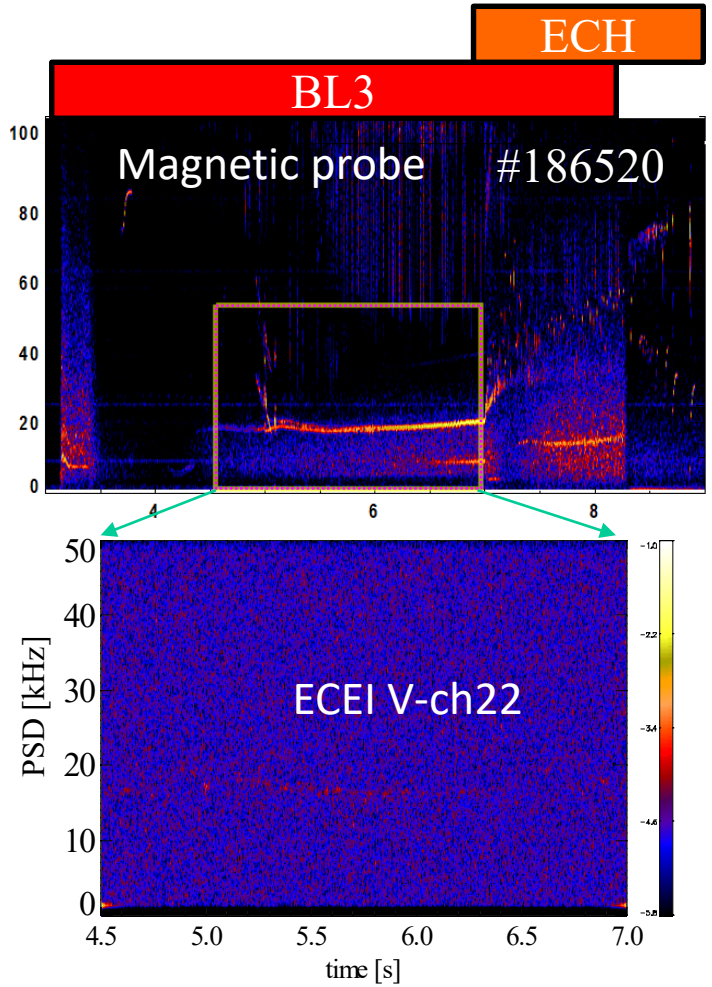
Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CW, 1.375 T, 1.2538, 100 %) #186505-186533
(R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CW, 1.25 T, 1.2538, 100 %) #186534-186543
(R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CW, 1.3 T, 1.2538, 100 %) #186544-186547

Motivation and objective: To investigate the 2D structure of electron temperature oscillations associated with GAM.

Results:

- The signal was weak due to the absence of the first NBI unit, but we have successfully generated oscillations that chirp up and continuous oscillations.
- We were also able to catch this oscillation on a few channels of the ECEI.
- Correlation analysis with a density and potential fluctuation will be done.





Effect of injection of different powder materials on plasma turbulence and performance

F. Nespoli

Experimental conditions:

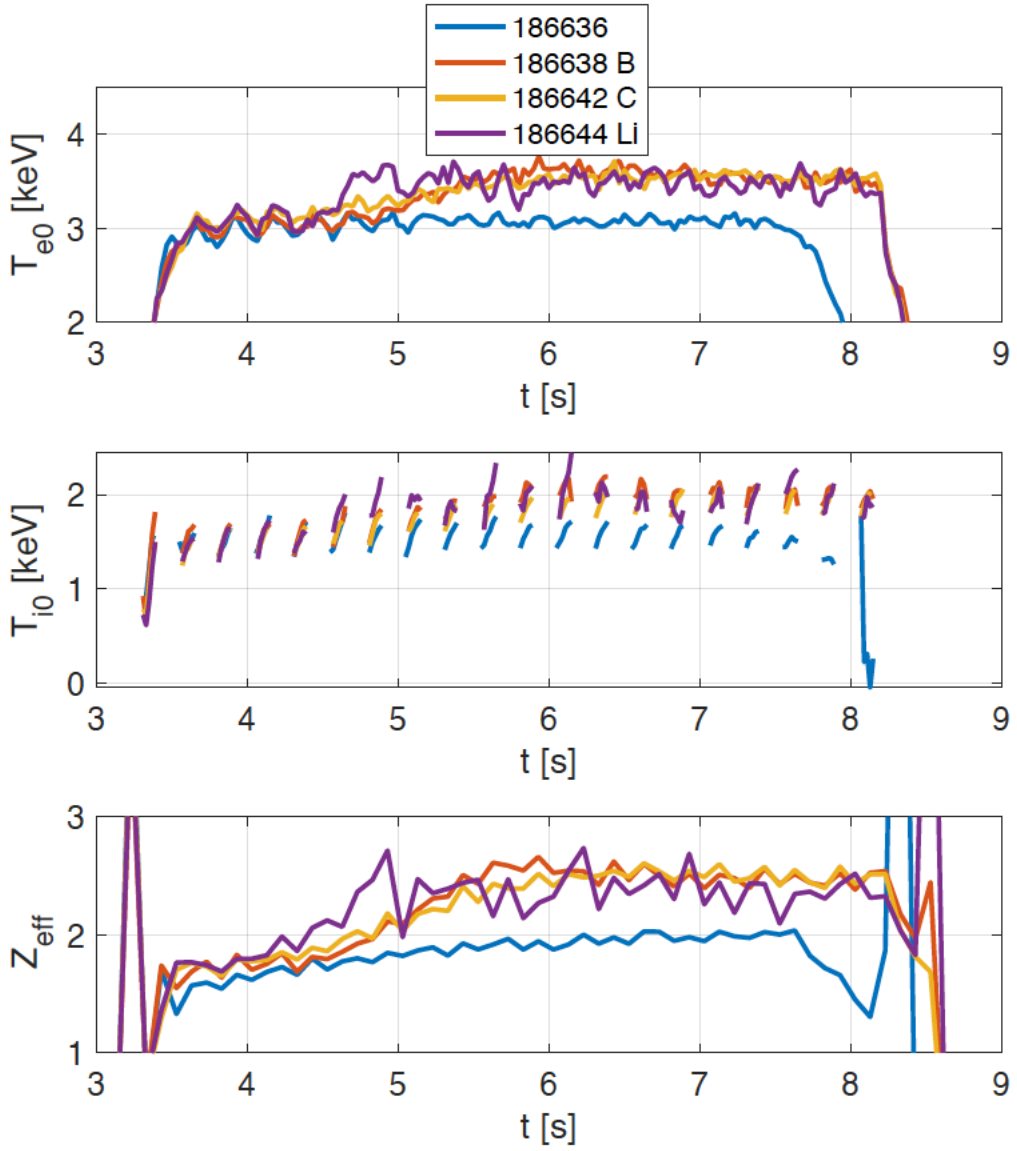
(R_{ax}, B_t, γ, B_q) = (3.60 m, CW 2.75 T, 1.2538, 100.0%) #186602-186647

Motivation:

- Investigation effect of different powder material on increase of plasma performance, reduction of turbulence
- Different scenarios with different density, input power investigated
- For each scenario, compared B, C, Li powder

Result:

- T_i and T_e increase for all three powder
- For similar Z_{eff}, effect on plasma temperature is about same
- Wall conditioning effects play a secondary role, Z_{eff} the main parameter?



Plasma control using turbulence level (H. Sakai (Kyushu Univ.), K. Tanaka, T. Kinoshita)

Shot No: #186650~186668 (19 shots)

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

Gas-puff: H_2

Approach

In previous experiments, the turbulence level (TL) and electron density had been used to control the turbulence, but this time only a TL was used to control the turbulence.

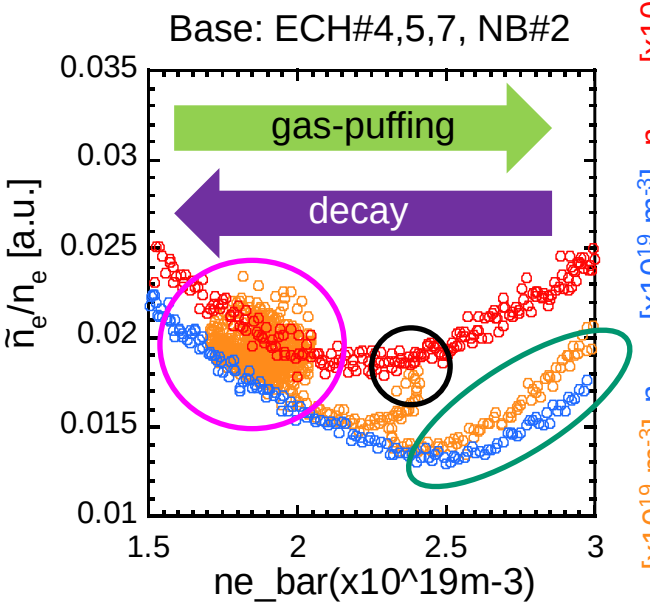
Only in the ITG region, gas-puffing was conducted.

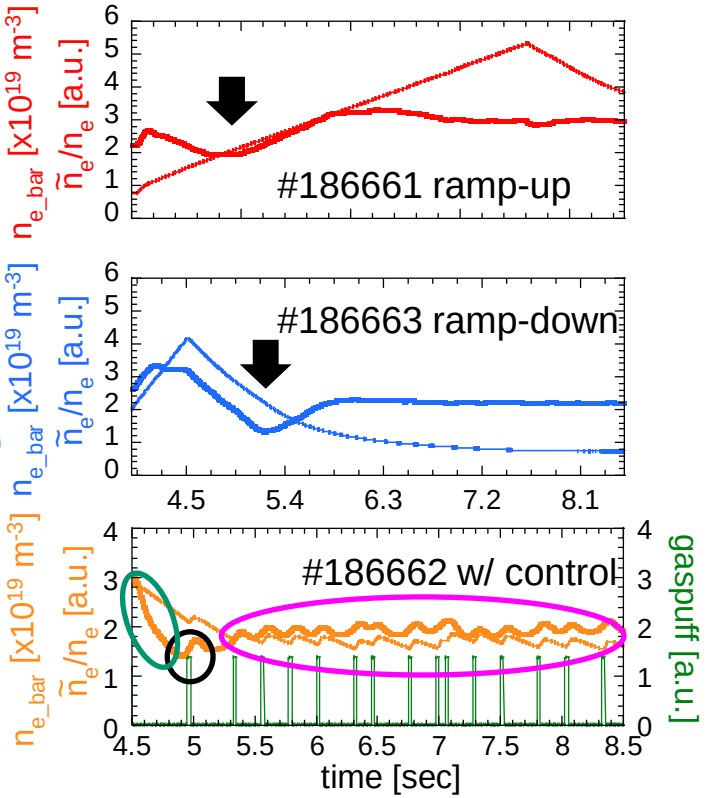
Difference values between timings of gas-puff off were used. (When gas-puff is off, density is in decay)

Thin: density
Thick: TL

Results

- ✓ The experiments of density ramp-up, ramp-down, and control were conducted.
- ✓ In orange line,
  - The curve of TL without gas-puffing (circled by **green**) was similar to ramp-down experiment.
  - The curve of TL with gas-puffing (circled by **black**) was similar to ramp-up experiment.
  - TL was controlled around 0.02, which was the bottom in ramp-up. (circled by **pink**)
- ✓ We will check the profile of density, temperature, turbulence and so on to clarify if this region is bottom or not.





☆We sincerely appreciate Nagahara-san and experimental operators.