# (TG3) Spectroscopy group report

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Nov. 18, 2022 (T. Oishi)

Date: Nov. 17, 2022 Time: 9:52 – 16:05 Shot#: 183620 – 183720 (101 shots) Prior wall conditioning:  $D_2$  GD Divertor pump: ON Gas puff:  $D_{2,}$  He, Ar Pellet: C (impurity pellet)

NBI#(1, 2, 3, 4, 5)=gas(D, D, D, D, D)=P(2.3, 2.9, 2.9, 6.6, 8.3)MW ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.703, 0.792)MW ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(0, 0.799, 0.825)MW ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0.4, 0, 0.73, 0)MW Neutron yield integrated over the experiment =  $1.6 \times 10^{17}$ 

# Topics

- 1. Evaluation of slowing down process for energetic particle by FIDA diagnostics (Y. Kawamoto)
- 2. Investigation of broadband phase space dynamics from bulk ions to energetic ions in energetic particle driven instability (Y.Kawachi)
- 3. Diagnosis of fast ions in quiescent plasmas for comparison to predicted neoclassical confinement (W. Hayashi [UCI])

# **Experimental conditions:** $(R_{ax}, Polarity, B_t, \gamma, B_q) = (3.6 \text{ m}, CCW, 2.75T, 1.254, 100.0\%)(\# 183619 - \#183638)$

#### [What I research]

**Background:** The difference between experimental data and simulation is confirmed under NB#2 injection. However, this data alone lacks information, making it difficult to elucidate the cause.

**Motivation:** I'd like to obtain spectral experimental data for NB#2 under more conditions.

**This experiment:** I got several spectra using FIDA system under changed the NB#2 energy

#### [What I did]

NB#2 energy changed 130keV~160keV (injection power is also changed)

#### [What I do next]

I Identify the cause of the simulation deviation from the spectra under several conditions obtained this time.



Typical shot pattern (#183631)

FIDA component (NB#2 injection) obtained by experiment

**Investigation of broadband phase space dynamics from bulk ions to energetic ions in energetic particle driven instability** Y. Kawachi et al

Shot #: 183639-183640 (total 38 shots)

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

**Objective:** Simultaneous observation of phase space dynamics of bulk ions and energetic ions during the Tongue/EIC events

## **Results:**

- To investigate the EIC/Tongue events, high Ti discharge were performed by perp. NBI w/ and w/o Carbon pellet.
- Phase space dynamics were measured by fast-CXS, fast-FIDA, CTS and NPAs. Several turbulence and RF fluctuations measurements were also performed.
- The EIC/Tongue events appeared reproducibly.
- Newly developed fast-FIDA which consists of spatial x 8ch wavenumber channels of PMTs successfully observed the response to NB#4. Further analysis associated the EIC/Tongue events will be conducted.
- The CTS measurement shows bursty signal associated EIC/Tongue events.



Diagnosis of fast ions in quiescent plasmas for comparison to predicted neoclassical confinement, w. Hayashi

#### **Background and objective**

- The gyrokinetic code GTC simulates fast-ion transport with neoclassical effects to construct a fast-ion distribution function
- The synthetic diagnostic code FIDASIM simulates FIDA spectra from a fast-ion distribution function
- Fast-ion diagnostic data (FIDA, VNC, NPA) for MHD-quiescent plasmas at various magnetic configurations will be compared to simulation

### **Experimental condition**

- Shots:
  - 183677 183696 (Rax = 3.55m, Bax = -2.789T)
  - 183698 183717 (Rax = 3.70m, Bax = -2.676T)
- ECH startup
- NB3, NB4, NB5 modulation

## <u>Results</u>

- Many quiescent shots with various parameters have been obtained for two magnetic configurations
  - Other magnetic configurations still need to be investigated
- A few shots show excellent conditions for comparison with simulation
  - GTC will use plasma parameters from select shots for simulations

