(TG3) Spectroscopy group report

Nov. 12, 2021 (T. Oishi)

Date: Nov. 11, 2021
Time: 9:54 – 15:24
Shot#: 172313 – 172412 (100 shots)
Prior wall conditioning: No
Divertor pump: ON
Gas puff: D_2
Pellet: No

NBI#(1, 2, 3, 4, 5)=gas(H, D, D, D, D)=P(2.2, 1.2, 1.2, 6.0, 4.9)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(0.979, 0.930, 0.986)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0, 0, 0, 0)MW
Neutron yield integrated over the experiment = 4.3×10^{16}

Topics
1. Diagnosis of fast ions produced by NNBI with FIDA spectroscopy (C. Muscatello (GA), S. Kamio)
2. Extension of FIDA database (S. Kamio)

Expansion of FICXS database; Diagnosis of fast ions produced by NNBI with FIDA spectroscopy; C.M. Muscatello

Objectives

- Validation of FIDA technique applied to very high-energy (>100keV) ions produced by N-NBI
- Verification of theoretical distribution functions with synthetic diagnostic modeling (GNET & FIDASIM)

Approach and Outcome

- Populate fast-ion distribution function. Scan n_{fast} (P_{NBI}) and slowing-down time (n_e, T_e).
- 61 shots total
- B_{ax}=2.75 T, Polarity = CCW, R_{ax}=3.6 m
- NBs and gyrotrons operated with high reliability
- FICXS, CXS, CTS, Thomson scattering for comprehensive fast-ion and plasma profiles
- Obtained good set of scans
- Thanks to LHD team for all of your coordination and support!

	Low P_{NBI}			Med P_{NBI}			High P_{NBI}		
	Low n_e	Med n_e	High n_e	Low n_e	Med n_e	High n_e	Low n_e	Med n_e	High n_e
Low Te	✓	✓	✓	✓	✓	✓	✓	✓	✓
Med Te	✓	✓	✓						
High Te	✓	✓	✓		✓	✓			

Extension of FIDA database (S. Kamio)

Experimental conditions:
(*R*ax, Polarity, *B*t, *γ*, *B*q) = (3.6 m, CCW, 2.85 T, 1.254, 100.0 %)
Shot numbers: #172381 - #172412 (31 shots)

Background and motivation:

The validation of FIDA measurement with FIDASIM was confirmed in an experiment in MHD-quiescent plasmas at a magnetic field strength of 2.75 T (CCW), a magnetic axis of 3.6 m. It is necessary to expand the FIDA and FIDASIM database to discuss the effect of MHD instability with fast-ion particles.

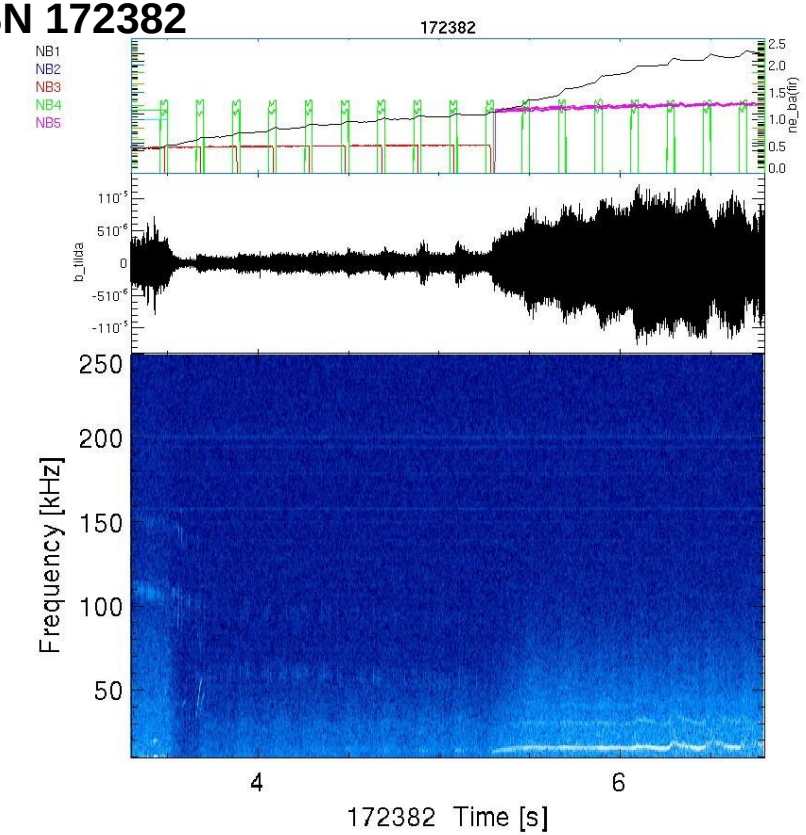
We have obtained high and low magnetic field configuration cases to build FIDA database. In this campaign, we will obtain sub-cool and low magnetic field configuration cases.

Results:

- We obtained density and power scan data in a range of electron density ne~0.4-1.5x1019 m-3 for Rax=3.6m on sub-cool magnetic field configuration with quiescent-plasmas.

- Right top figure shows an example of typical discharge. As you can see, magnetic fluctuation is very weak.

SN 172382



Sub-cool magnetic field	R=3.55	R=3.6	R=3.75
CCW		23 cycle	
CW			
High magnetic field	**R=3.55**	**R=3.6**	**R=3.75**
CCW		20,21 cycle	22 cycle
CW		22 cycle	22 cycle
Low magnetic field	**R=3.55**	**R=3.6**	**R=3.75**
CCW		22 cycle	
CW			