(TG3) Spectroscopy group report

Nov. 16, 2021 (T. Kawate)

Date: Nov. 16, 2021
Time: 14:20 – 18:05
Shot#: 172700 – 172771 (72 shots)
Prior wall conditioning: D2
Divertor pump: On except for 2-I
Gas puff: D_2, Ar, N_2, Ne
Pellet: TESPEL(SiB_6, AlN, $CaAl_2O_4$, V, Mn, Ni, Fe, Cu)
NBI#(1, 2, 3, 4, 5)=gas(D, D, D, D, D)=P(2.2, 2.3, 2.2, 0.0, 4.9)MW
ECH(77GHz)=ant(5.5-U, 2-OUR)=P(703, 792)kW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(723, 799, 825)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 = 7.0×10^{16}

Topics

1. Light impurity transport studies in D/H plasmas at LHD using VUV spectroscopy (T. Fornal, N. Tamura)
2. Impurity transport study in LHD D/H plasmas using VUV spectroscopy in experiment with TESPEL injection (M. Kubkowska, N. Tamura)

Light impurity transport studies in D plasmas at LHD using VUV/VIS spectroscopy (T. Fornal et al.)

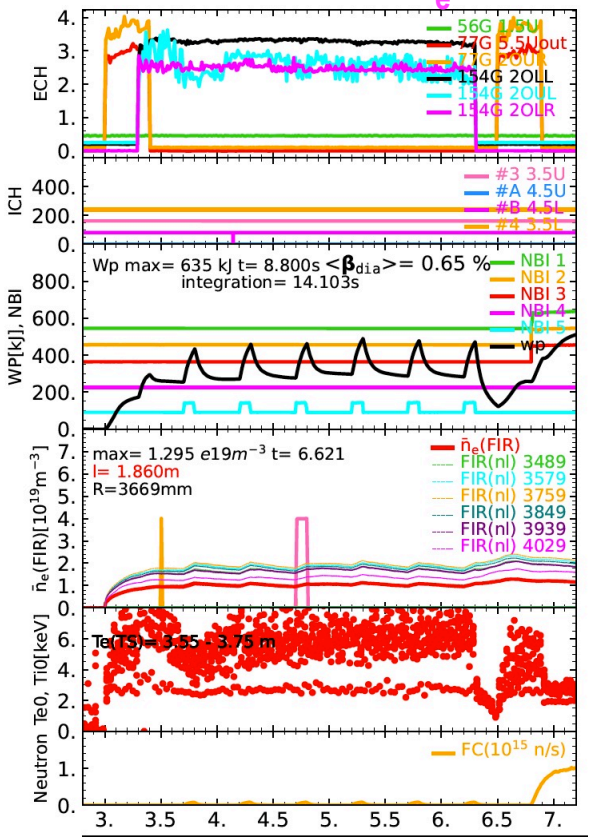
Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CW, 2.75 T, 1.2538, 100.0%)
Shots: #172700 - #172736
Goal of this experiment:

- To investigate the behavior of light impurities (B, C, N, O) in the hydrogen plasma of LHD and its comparison to the deuterium case, and its comparisons with the results in W7-X

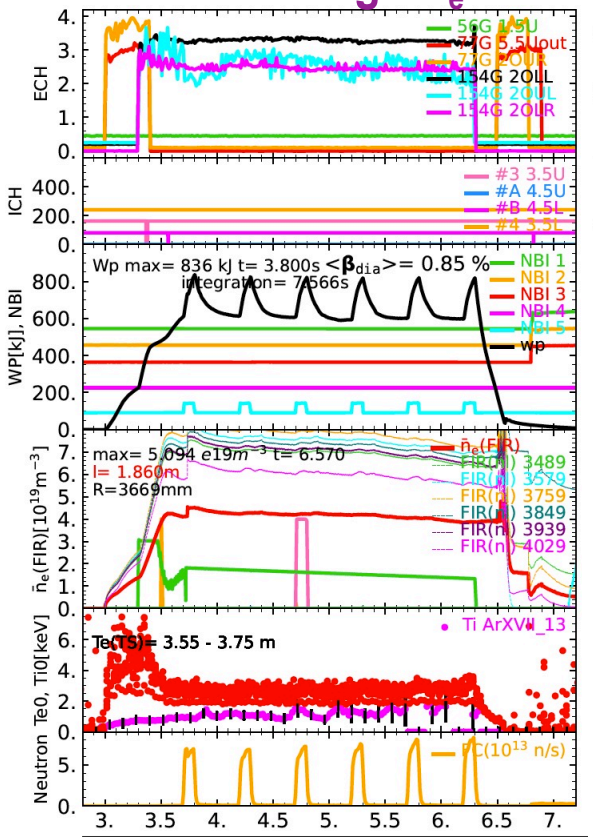
Main results of this experiment

- **TESPELs**(SiB_6, **Al**N, $CaAl_2$**O_4**) (t = 3.73 s)and **N_2 gas puff** (t = 4.7s - 4.9s) are injected into the EC-heated D LHD plasmas with a various density from 1E19 m^{-3} to 4E19 m^{-3}

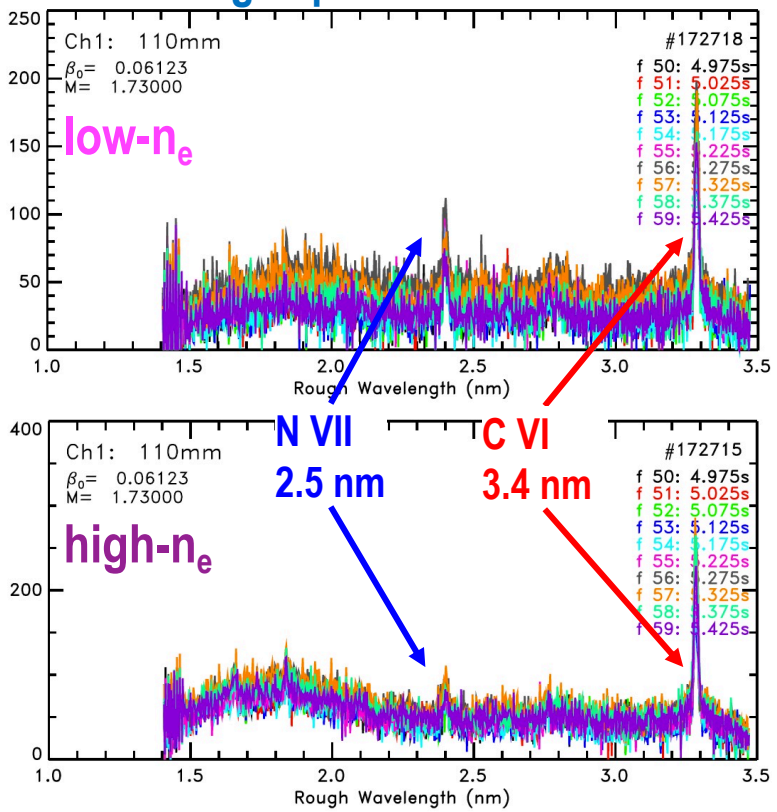
#172718: low-n_e



#172715: high-n_e



Spectra measured with SOXMOS after N2 gas-puff



N VII intensity in the high-ne case is lower than that in the low-ne case
→ "Impurity screening" has been observed with N VII 2.5 nm

- ✓ one of target lines with "CO-monitor" to be installed at W7-X

Study of impurity transport in ECR-heated LHD plasmas with TESPEL injection (M. Kubkowska et al.)

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CW, 2.75 T, 1.2538, 100.0%)
Shots: #172737 - #172771

Goal of this experiment

- To obtain the data by using **TESPELs containing quadruple tracers (V/Mn/Ni + Fe or Cu)** for comparisons with the future results in W7-X

Main results of this experiment

- **(V/Mn/Ni + Fe or Cu)-TESPELs are successfully injected** into the LHD plasmas with n_e up to 3E19 m^{-3}

V/Mn/Ni + Fe

	1e19	2e19	3e19	4e19
3 x 154 GHz (2.35 MW)	✓	✓	Not conducted	Collapsed
2 x 154 GHz (1.52 MW)	✓	✓	Collapsed	Not Conducted

V/Mn/Ni + Cu

	1e19	2e19	3e19	4e19
3 x 154 GHz (2.35 MW)	✓	✓	✓	Collapsed
2 x 154 GHz (1.52 MW)	✓	✓	Collapsed	Not conducted

- Over 10 emission lines from V/Mn/Ni + Fe or Cu have been observed
  - ✓ To be identified & to be analyzed later

@n_e~2e19 m^{-3}