(TG1) Multi-ion group report

Nov. 29, 2022 (G. Motojima)

Date: Nov. 25, 2022
Time: 9:51-15:30
Shot#: 184390-184497 (108shots)

Prior wall conditioning: No

Divertor pump: No
Gas puff: D_2, H_2
H pellet: NO

NBI#(1, 2, 3, 4, 5) = gas(D, D, D, D, D) = P(2.1,2.2,0.8,4.2,3.8)MW

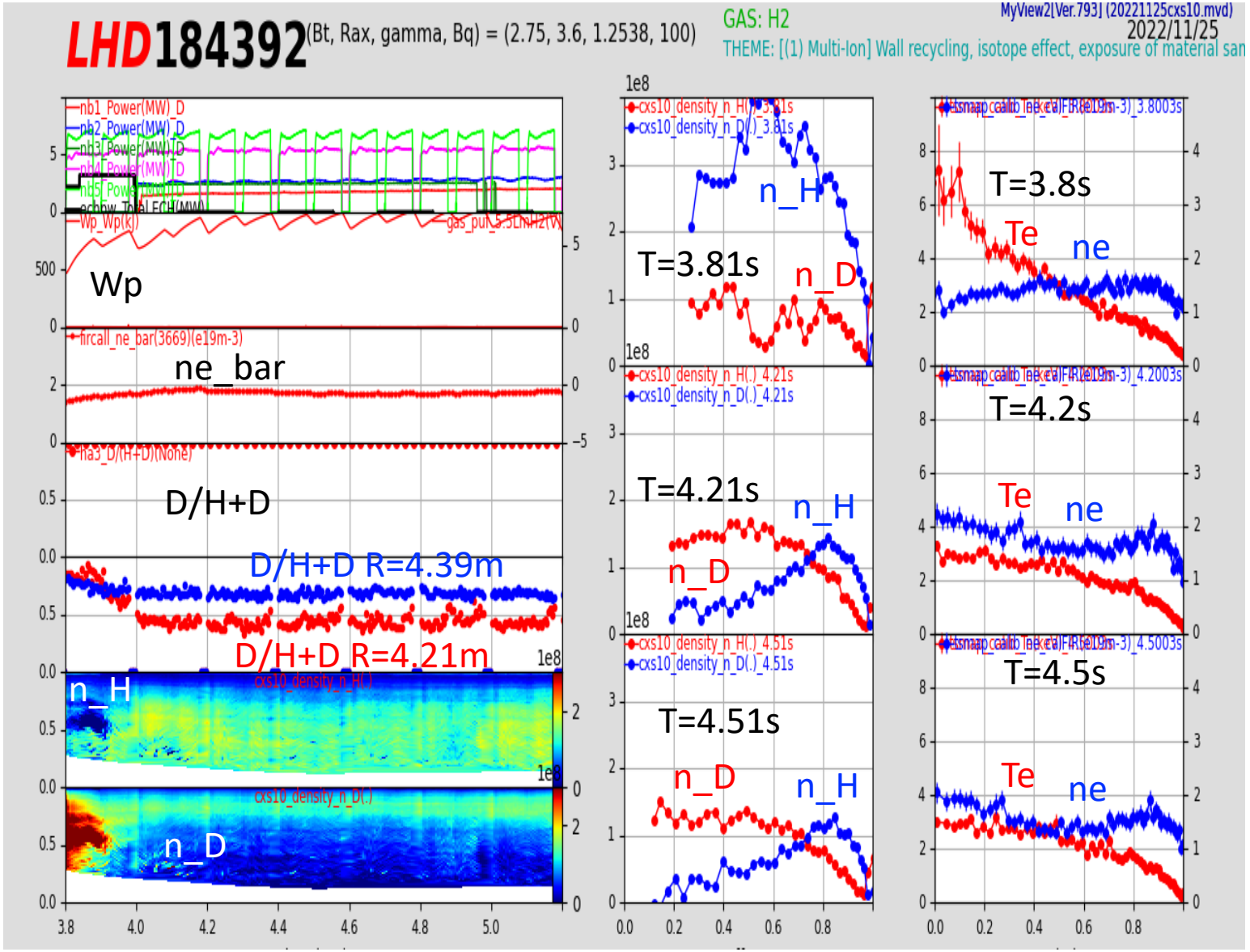
ECH(77 GHz) = ant(5.5-Uout, 2-OUR) = P(703,0) kW
ECH(154 GHz) = ant(2-OLL, 2-OUL , 2-OLR) = P(723,799,986) kW
ECH(56 GHz) = ant(1.5U) = P(-) kW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(0,0,0,0) MW
Neutron yield integrated over the experiment = 1.8×10^{17} (TG1)

Topics

1. Wall D/H recycling process (G. Motojima)
2. Isotope mass effects on sustainment of e-ITB plasma (N. Kenmochi)
3. Exposure of W samples to divertor plasma (C.P. Dhard, D. Naujoks (IPP), S. Masuzaki)

Wall D/H recycling process (G. Motojima)

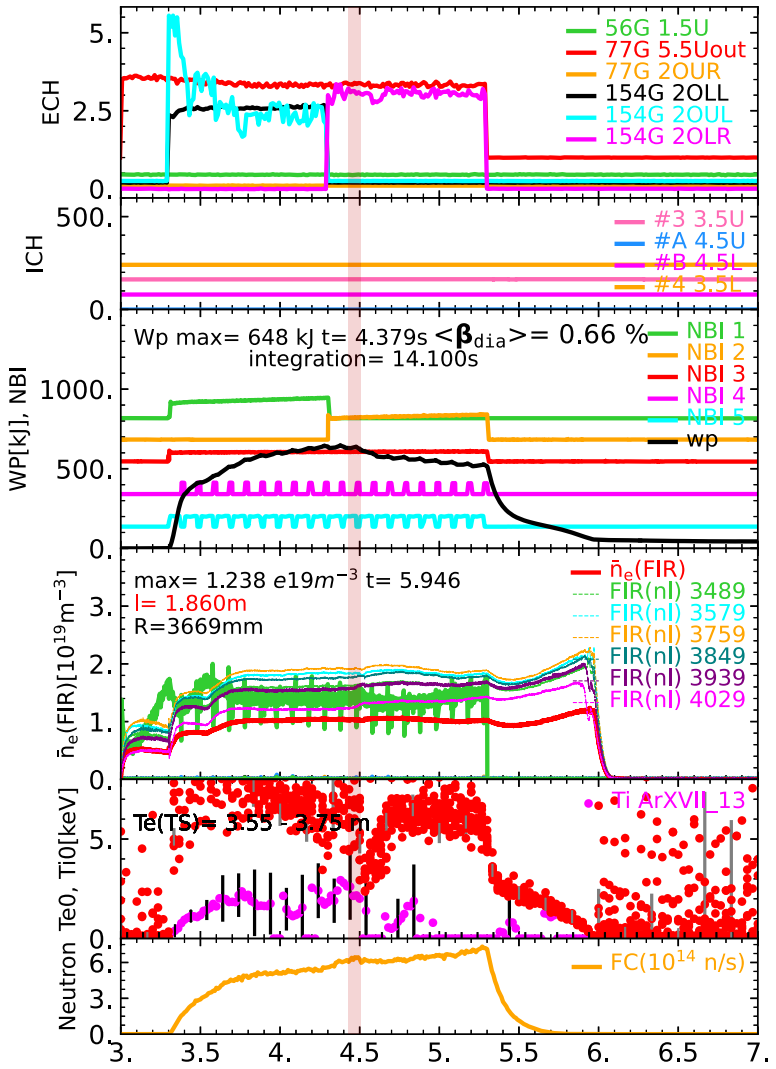
- ✓ #184390-184421
- ✓ R_{ax}=3.6m, B=2.75T, γ=1.254, Bq=100%
- ✓ Working gas: H_2, D_2, SSGP(H_2)
- ✓ Motivation
  - ❖ To understand the wall recycling process, the plan was to inject H-pellets after the D-wall, but due to a problem of the pellet injector, SSGPs were used.
- ✓ Results
  - ❖ The D/H+D measured by passive spectroscopy is 1 showing D-rich. In addition, all the injection gases in the NBI are Deuterium.
  - ❖ An example of a discharge before SSGP(H) injection is shown. It is curious to see that, although n_D is almost dominant in the early stages of the discharge, in the NBI phase, n_D has a hollow distribution and n_H has a central flat distribution. This means that in the discharge before the SSGP is injected, there is already hydrogen recycling from the wall and hydrogen is supplied to the plasma core.
  - ❖ Also, the reason for the non-mixing state has not yet been explained and will be analysed in detail including SSGP(H) shots.



Isotope mass effects on sustainment of e-ITB plasma

(N. Kenmochi)

184436 B=2.750T R_{ax}

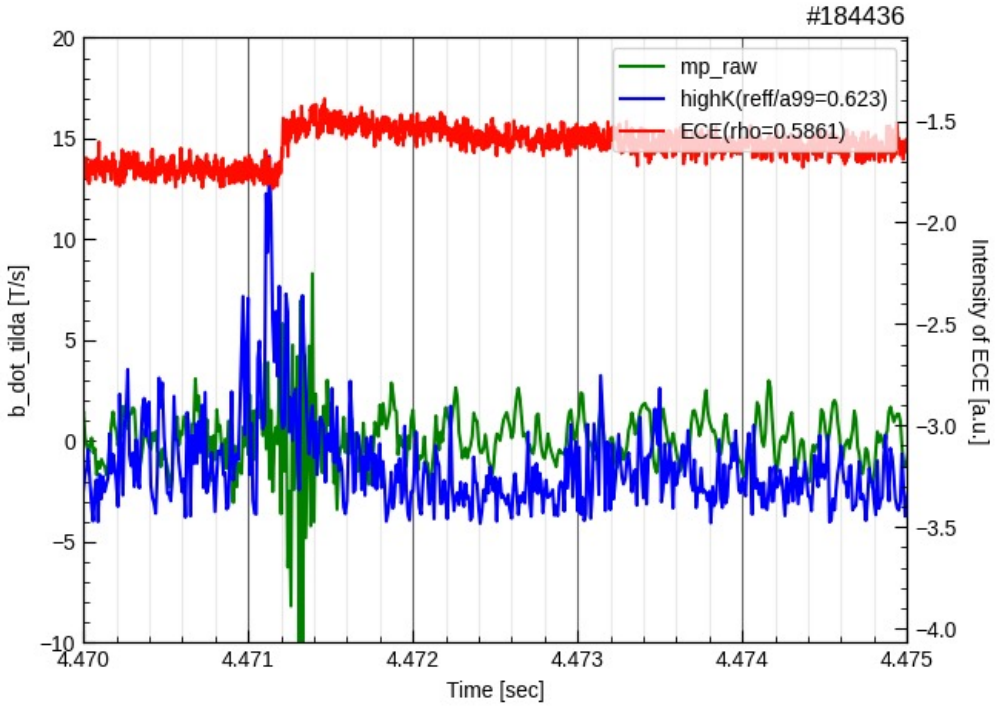


Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%)
Co. to Ctr. current drive at center region (# 184425 - #184469), Deuterium plasma

Objective: To clarify the isotope mass effect of the eITB sustainment and turbulence pulse propagation.

Results:

- ✓ Minor collapses of e-ITB was repeatedly observed around m/n=1/2 magnetic island.
- ✓ The measurement positions of both BS and HIBP were scanned in a shot-to- shot basis.
- ✓ The isotope mass effects for minor collapse and turbulence spreading will be investigated.



Exposure of W samples to divertor plasma

C.P. Dhard, D. Naujoks (IPP), S. Masuzaki

Shot #: 184470 - 184497

(R_{ax}, B_t, γ, B_q) = (3.6 m, 2.75 T, 1.2538, 100.0%)

Working gas: D2

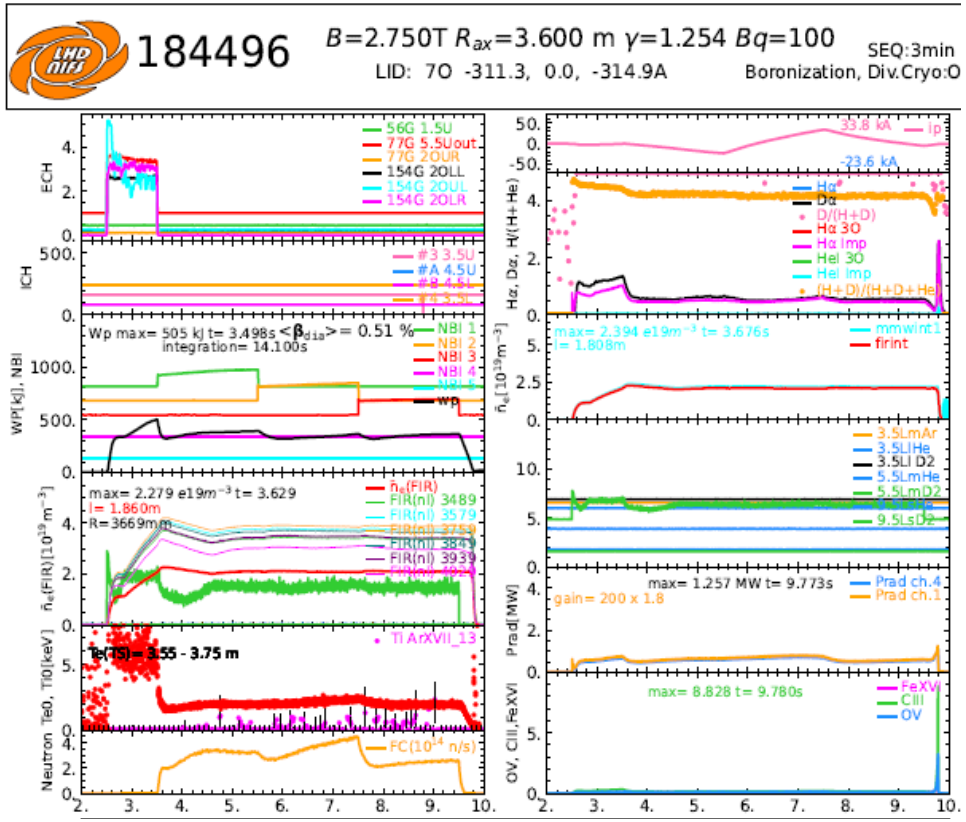
P_{NBI-1} ~ 2.0 MW, P_{NBI-2} ~ 2.8 MW, P_{NBI-3} ~ 2.2 MW

Motivation

- Tungsten is appearing as a potential material for fusion reactor applications. However, because of its hardness and brittleness, it is not so easy to manufacture. W-alloys are being explored to overcome these problems.
- In this experiment, W-alloys samples are exposed to the LHD divertor plasma to investigate the effects of the deuterium plasma exposure on samples properties.

Results

- Three sets of W alloy samples (W95%-Cu/Ni, W95%-Fe/Ni, W97%-Fe/Ni) and a set of pure W were exposed to divertor plasma using the manipulator at a 10.5L port.
- Total ~ 140s exposure was conducted.
- Line averaged density was kept to be ~ 2E19/m3.
- Surface analyses will be conducted as soon as possible.



Typical shot