

# (TG1) Multi-ion group report



Dec. 14, 2022 (M. Kobayashi)

Date: Dec. 13, 2022

Time: 9:50 – 12:08, 15:48 - 18:45

Shot#: 185750 – 185796, 185867- 185907 (88 shots)

Prior wall conditioning: No

Divertor pump: On

Gas puff: H<sub>2</sub> IPD: No

LID: On

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(1.1, 2.0, 1.9, 3.7, 3.7) MW

ECH(77GHz)=ant(5.5-U, 2-OUR)=P(703, -)kW

ECH(154GHz)=ant(2-OLL, 2-OUL, 2O-LR)=P(723, 799, 986) kW

ECH(116GHz)=ant(2O-LR)=P(-)kW

ECH(56GHz)=ant(1.5-U)=P(-)kW

ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -) MW

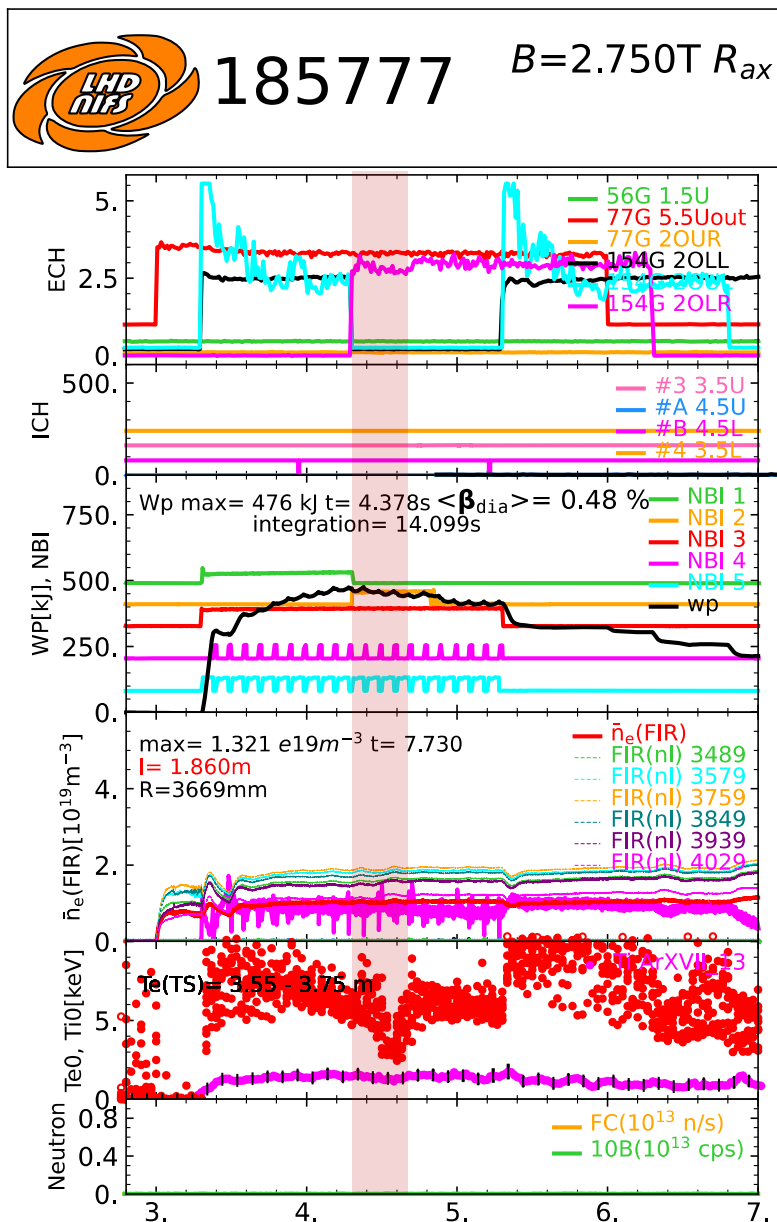
Neutron yield integrated over the experiment =  $6.9 \times 10^{13}$

## Topics

1. Isotope mass effects on sustainment of e-ITB plasma (N. Kenmochi)
2. Validation of established 0-dimensional wall model simulation for LHD (Zhengnan Jiang)
3. Feed-forward of high performance conditions in pellet fueled plasmas (A. Dinklage, G. Motojima)

# Isotope mass effects on sustainment of e-ITB plasma

(N. Kenmochi)



## Experimental conditions:

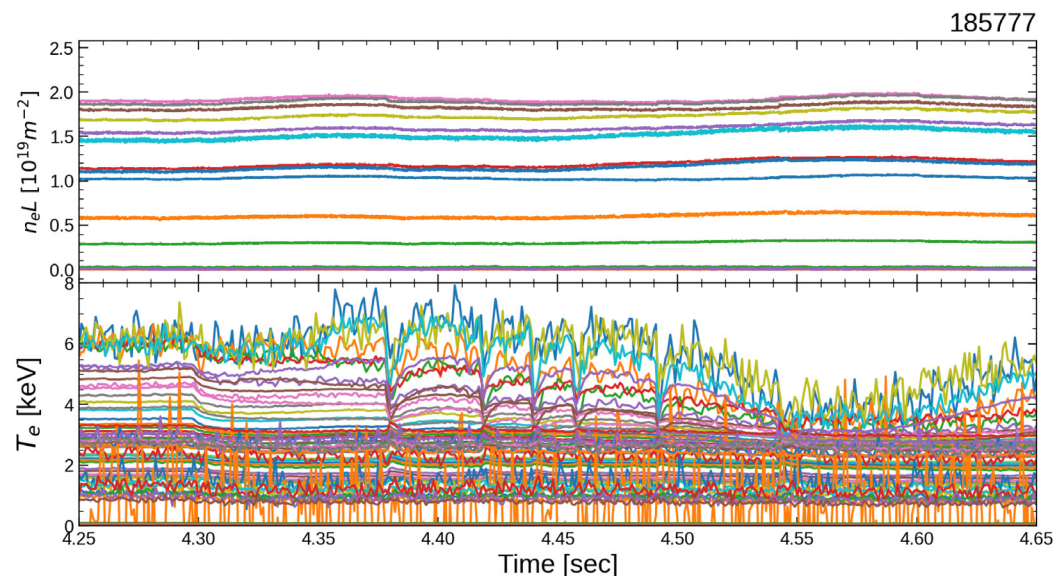
( $R_{ax}$ , Polarity,  $B_t$ ,  $\gamma$ ,  $B_q$ ) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%)

Co. to Ctr. current drive at center region (# 185750 - #187796), H/(H+D)=0.8

**Objective:** To clarify the isotope mass effect of the e-ITB 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.
- ✓ Non-thermal component of electron temperature was measured with high temporal resolution by combining fast Thomson scattering measurement and 9-CH polychromator.
- ✓ The isotope mass effects for minor collapse and turbulence spreading will be investigated.





# Validation of established 0-dimensional wall model simulation for LHD

Zhengnan Jiang, Gen Motojima, Mamoru Shoji

- Shot number:

186867~185884: ECH extension & test

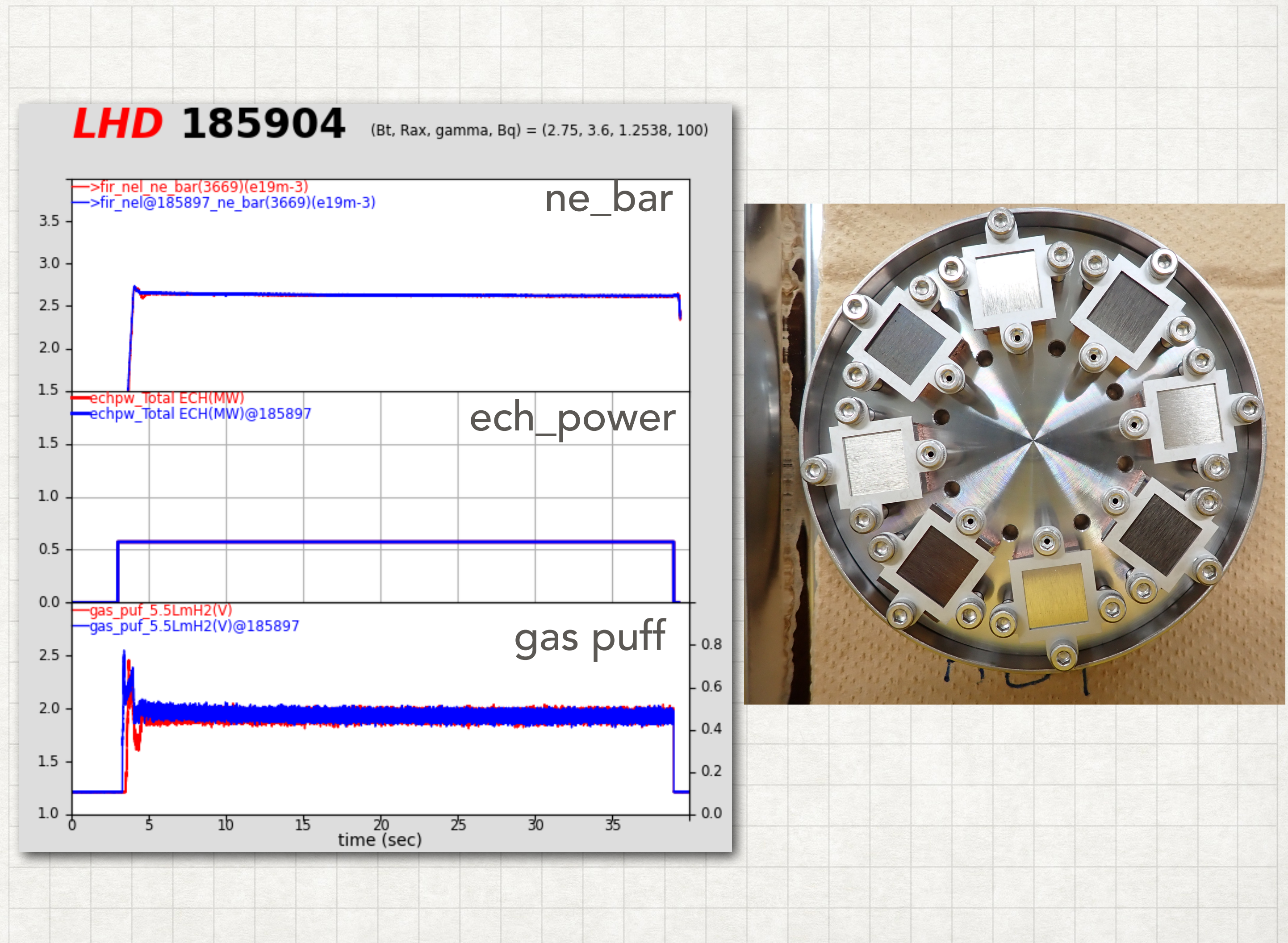
185885~185907: Collapse shots & steady shots

- Motivation:

We planned to conduct steady discharges after collapsed discharges, to study the particle supplies from the plasma facing materials (PFMs) by simulation with Hydrogen barrier model.

- Result:

- We conducted 5 shots each after a collapsed shot, and 9 continuous shots with density scanned from  $3.5 \times 10^{19} m^{-3}$  to  $1.9 \times 10^{19} m^{-3}$ . Samples from the first wall is inserted by manipulator 4.5L during shot No.185885 to No.185900.
- By comparing steady shots with densities at  $2.5 \times 10^{19} m^{-3}$  which is after / not after a collapse shot, for example shot No.185904 and shot No.185897, the similar gas puff signal is observed, suggesting that few particles are supplied from the PFMs.







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**Debriefing of Experiments Dec.13, 2022**  
**Research Proposal 24/002637: *Feed-forward of high performance conditions in pellet fueled plasmas***

**A. Dinklage (IPP), G. Motojima (NIFS), R. Sakamoto (NIFS), K. McCarthy (CIEMAT), I. Cortes (CIEMAT)**



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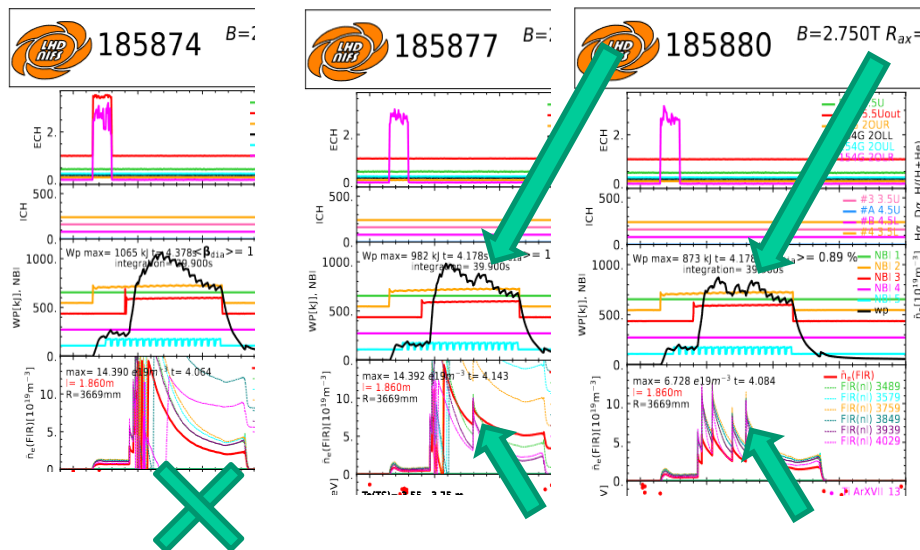


## Aim of the experiment:

Develop scenarios to keep high plasma energy with pellet injection

### Conducted experiments:

- shots 185867-185880
- Piggy-back on ECH pulse prolongation
- Scheme: inject 8 pellets to get to high  $W_{dia}$ , add up to two more pellets at different delay times



### Some findings:

- Additional pellets keep  $W_{dia}$  high  
-> promising proof-of-principle
- Pellet delay of addtl. pellets to be optimized
- Performance ( $nT\tau$ ) to be assessed in more detail