(TG2) Turbulence Topical Group Report

Date: Nov. 10, 2022
Time: 9:30 - 18:45
Shot#: 182964 – 183126 (163 shots)

Nov. 11, 2022 (T. Kobayashi)

Prior wall conditioning: NO
Divertor pump: YES
Gas puff: D2, H2 Pellet: NO
NBI#(1, 2, 3, 4, 5)=gas(D, D, D, D, D)=P(2.2, 2.0, 1.4, 6.1, 8.1)MW

ECH(77GHz)=ant(5.5-Uout (or 1.5U), 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(0.71, 0.63, 0.67, -)MW
Neutron yield integrated over the experiment = 1.8×10^{17}

We had a trouble in Kaiseki server and data viewer on the central screen stopped.
Tentatively (for ~ 1 hour) old viewer system (Funaba system) was invoked.

Topics

1. Two-dimensional profile measurement for EGAM (A. Shimizu)
2. Density ITB measurement (H. Takahashi)
3. Turbulence transition phenomena (T. Kinoshita and K. Tanaka)
4. Turbulence suppression by fast ions (D. Moseev and H. Kasahara)

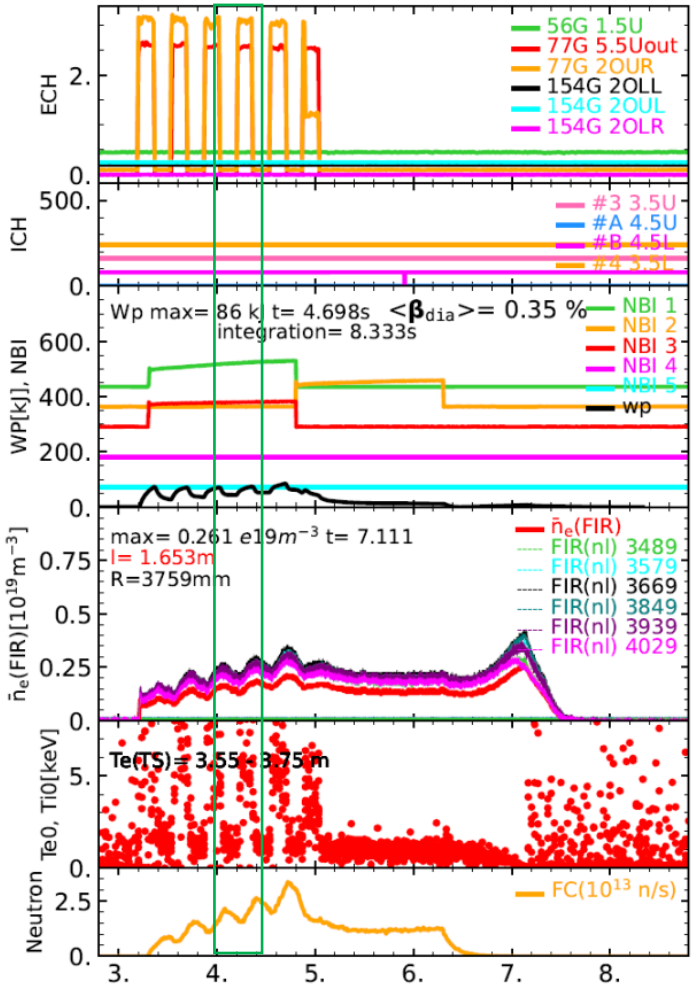
2D profile of EGAM and its influence on the turbulence and radial transport of bulk plasmas (A. Shimizu, M. Nishiura, T. Ido(Kyushu Univ.))

Shot #: 182964 - 183020

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CW, 1.375 T, 1.2538, 100 %)

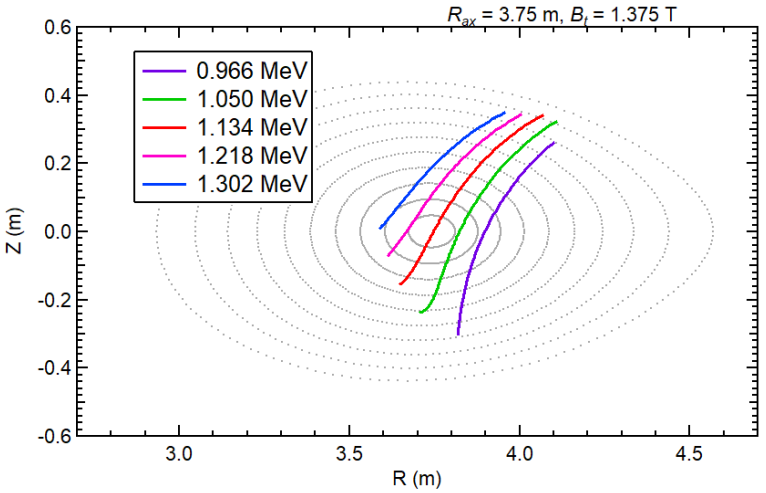
Motivation and objective: To investigate 2D profile of potential and density fluctuation of EGAM

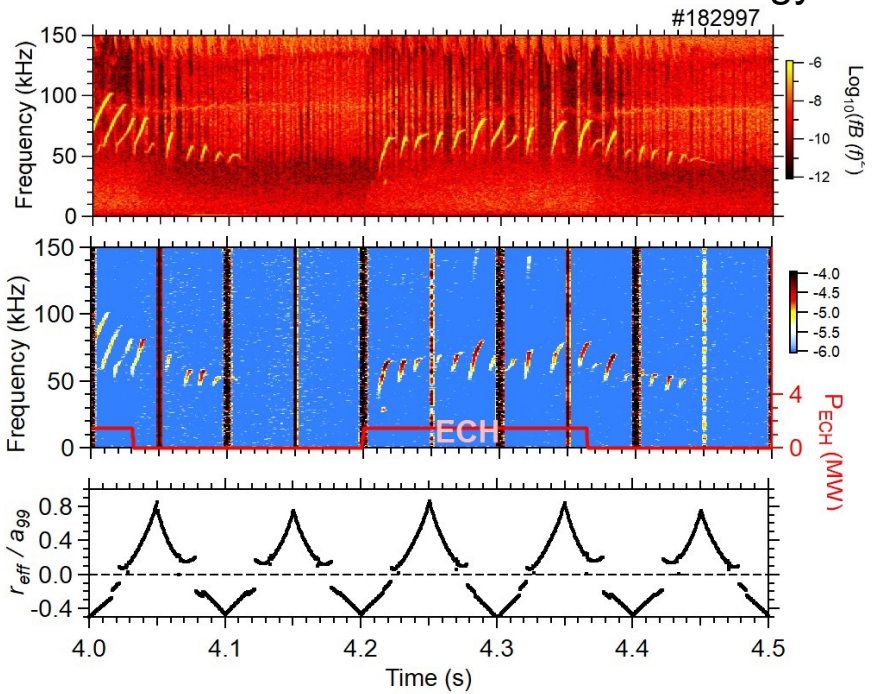
#182997



Results:

- We performed measurement of 2D profile of potential and density fluctuation associated with EGAM by HIBP.
- In this cycle, fluctuation of EGAM in D plasma sustained by tangential D beam (NBI#1 and NBI#3) is measured. This data will be compared with that in H plasma in previous experiments.
- Beam energy of HIBP was changed shot to shot. Total of 5 cases of beam energy was scanned.





Investigation of ne-ITB and the coupling with temperature-ITBs (H. Takahashi and T. Tokuzawa)

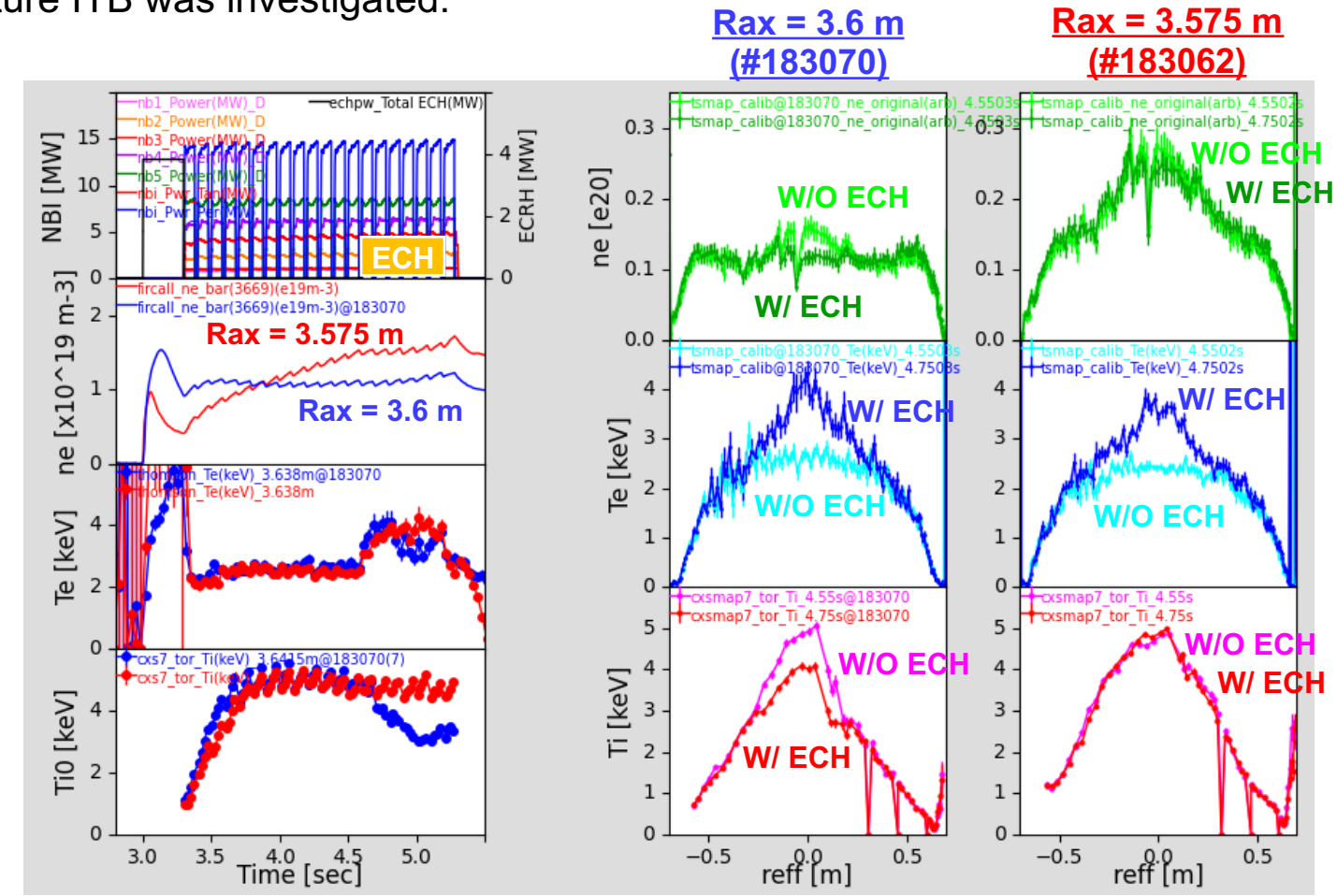
Shot #: 183021 - 183073

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CW, 2.7887 T, 1.2538, 100 %)
(3.575 m, CW, 2.7692 T, 1.2538, 100 %), (3.6 m, CW, 2.75 T, 1.2538, 100 %)

Motivation and objective: Density ITB was observed in the previous cycle's experiment. In this experiment, possibility of the simultaneous formation of density ITB and temperature ITB was investigated.

Results:

- We successfully obtained ne-ITB accompanied with the Ti-ITB in all the target configuration.
- The peaking factor was larger in the inward-shifted configuration.
- ECRH was superimposed on the plasmas to form the Te-ITB simultaneously.
- Simultaneous ITB formation in the ne, Te, and Ti was successfully attained in the inward-shifted configuration, on the other hand, the density peaking vanished and the core Ti was degraded in the 3.6 m configuration.
- ECH power scan (Te/Ti scan) and the NBI switching were conducted with the MSE, the reflectometer, and the HIBP measurement. The data will be analyzed.



Exploration of key parameters of turbulent transitions

T. Kinoshita(Kyushu Univ.), K. Tanaka, H. Sakai (Kyushu Univ.)

Shot No: #183074~183107 (34shots)

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100 %)

Gas-puff: D2

Background & Motivation

In our previous studies, we found a turbulent transition, which is the cause of isotope effects in LHD (submitted). What is a crucial parameter for turbulence transition?

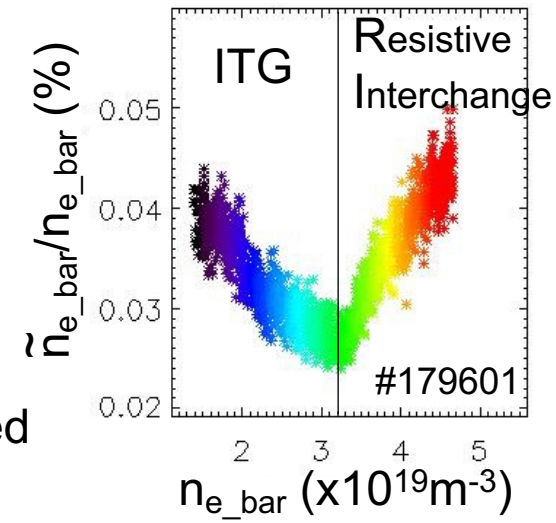
Approach

- Ramp-up experiments with various heating patterns
- Density and temperature modulation

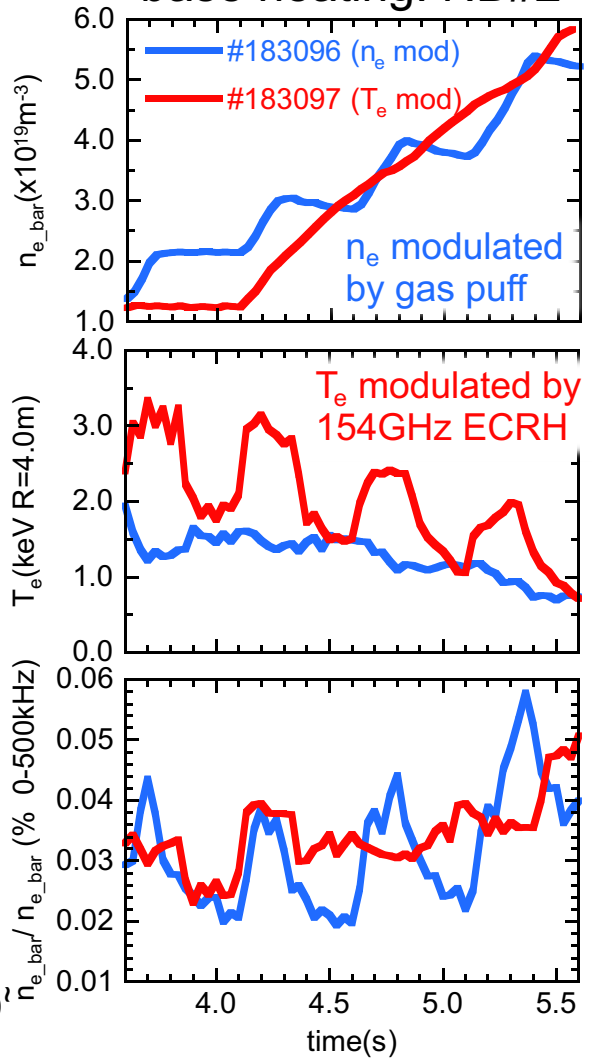
Results

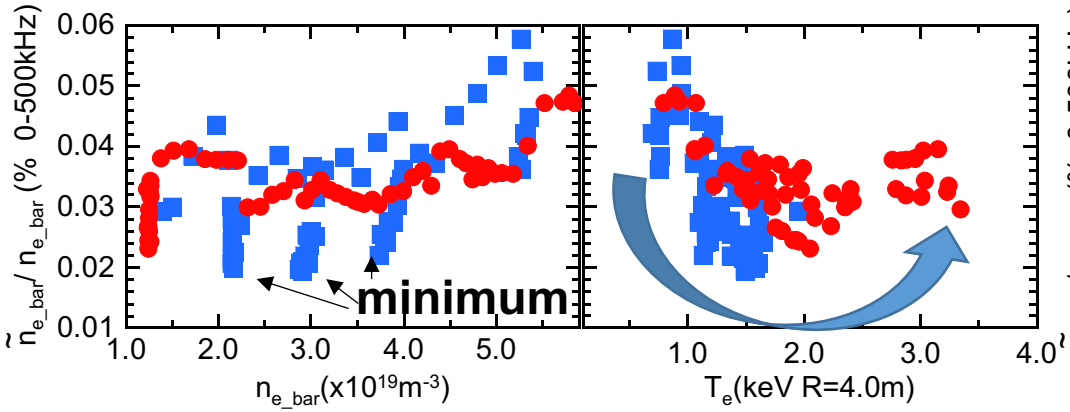
- Turbulence data around the turbulent bottom was obtained with various heating patterns.
- In the case of NB2 heating, when sorted out by n_e, there was a sudden turbulence suppression, but when sorted out by T_e, both discharges showed a similar dependence.
- We will check the dependence on density and temperature gradient, and search key parameters.

turbulence transition



base heating: NB#2





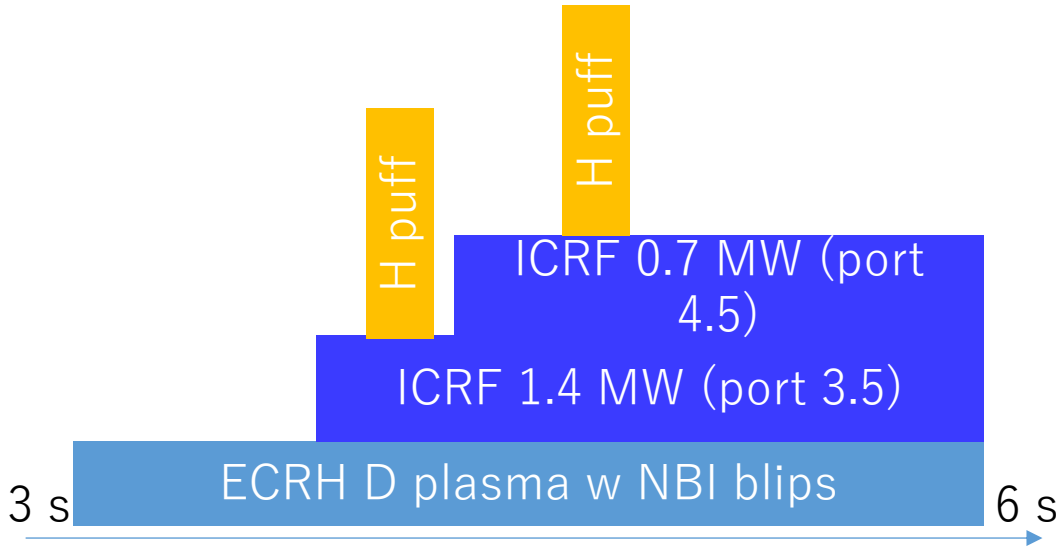
Turbulence suppression by ICRF-generated fast ions (D. Moseev, H. Kasahara, K. Tanaka)

Shot #: 183109 - 183126
Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.254, 100 %)

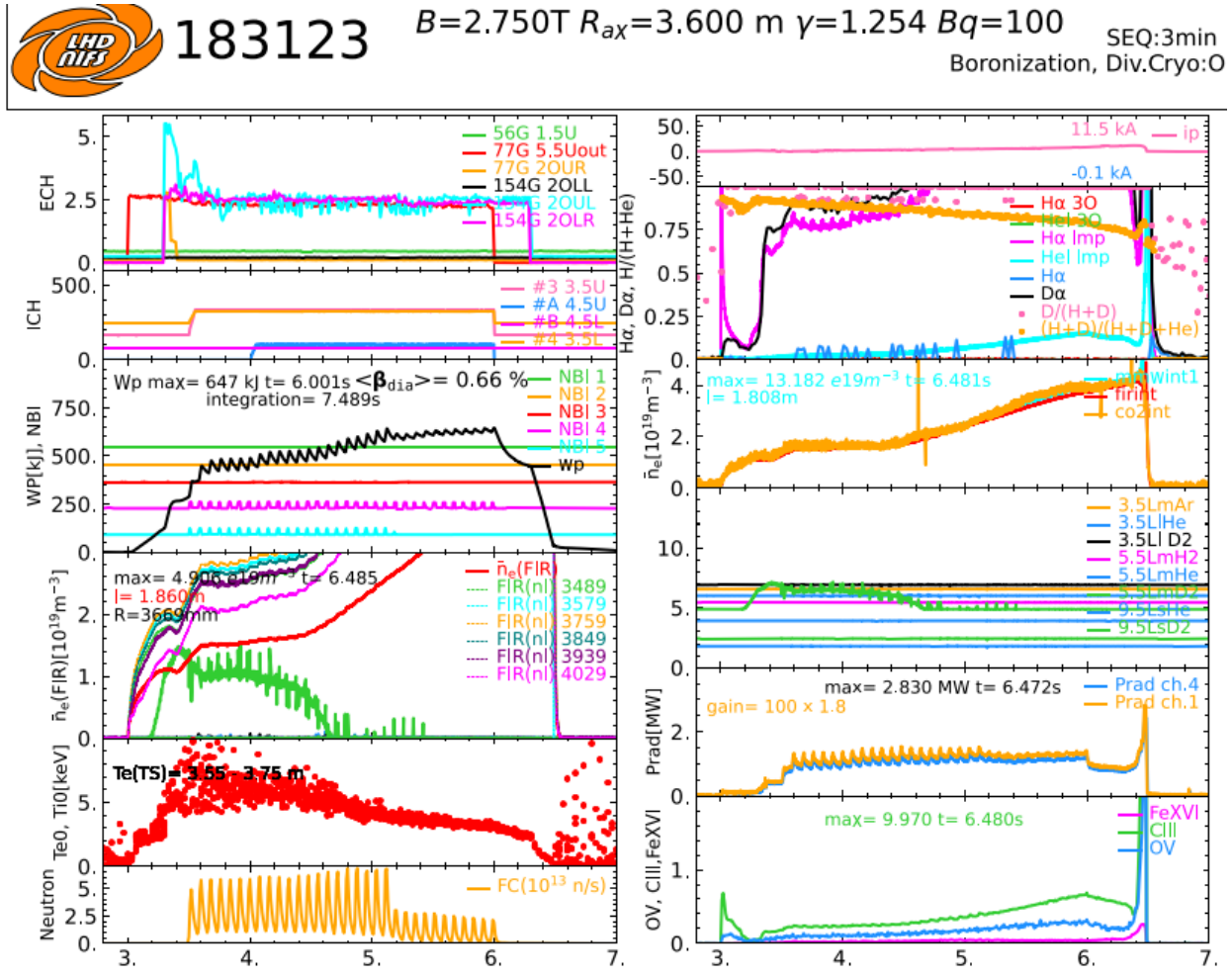
Motivation and objective: Demonstration of ITG turbulence suppression by fast ions. Formation of F-ATB was observed in AUG and reproduced by GENE (A.Di Sienna et al., PRL 2021). Stabilization is local, function of fast ion temperature, pressure, and pressure gradient on flux tube.

Results:

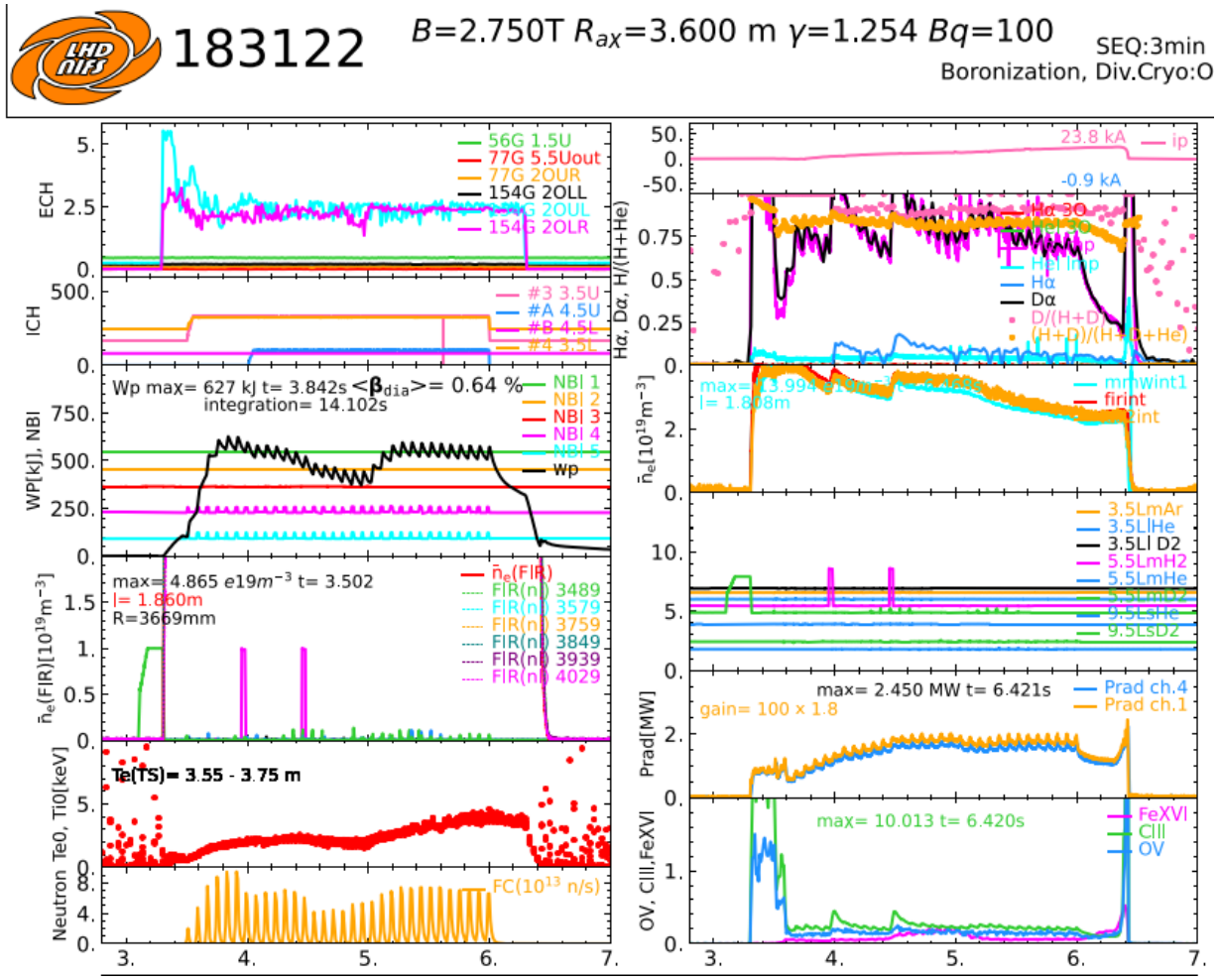
- Clear signature of fast ions seen on the neutron monitor.
- Good ICRF coupling (no arcing, FI production)
- Scanning hydrogen content by various gas puff
- Scanning ECRH power in order to trigger the turbulence
- High values of stored energy at moderate heating: long τ_E
- Profiles, PCI data, H/H+D ratio still to be analyzed



Turbulence suppression by ICRF-generated fast ions (D. Moseev, H. Kasahara, K. Tanaka)



NO H PUFF



MAX H PUFF (30 ms)