(SG2, TC) Session Report

May 8, 2024 (T.Kobayashi)

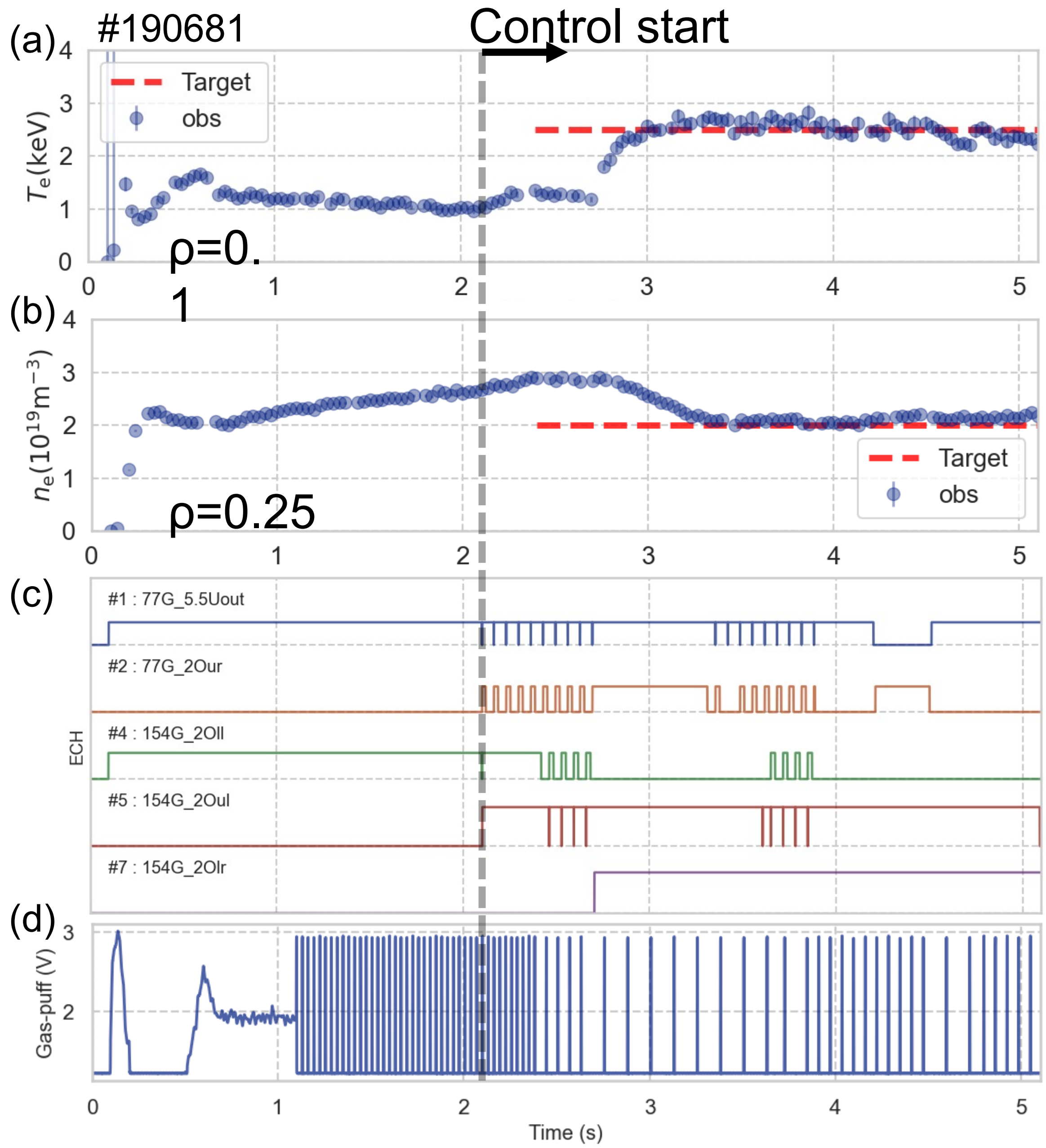
Date: May 2, 2024
Time: 10:30 -11:45, 14:08-16:45
Shot#: 190574 -190599, 190629 -190681 (78 shots)
Prior wall conditioning: No
Divertor pump: On
Gas puff: H_2, Ar
Pellet: No

NBI#(1, 2, 3, 4, 5) = gas(H, H, H, H, H)=P(3.0, 3.3, 3.3, 3.0, 5.2) MW
ECH(77GHz) = ant(1.5-Uo, 5.5-U, 2-OUR)=P(0.337, 0.380, 0.389) MW
ECH(154GHz) = ant(2-OLL, 2-OUL, 2-OLR)=P(0.580, 0.606, -) MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -) MW

Topics

1. Demonstration of real-time ECH plasma control by the data assimilation system ASTI(S. Murakami, N.Kenmochi)
2. Characteristics of millimeter wave vortex on heating, current drive, and propagation in high-density plasmas (S. Kubo, M.Nishiura)

Demonstration of real-time ECH plasma control by the data assimilation system ASTI (S. Murakami, Y. Morishita, N. Kenmochi)



Shot #: 190579-190599, 190655-190681

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.254, 100 %)

Motivation and objective:

To demonstrate the electron temperature and density control by the data assimilation-based control system .

Results:

- In addition to the ECH system, the gas-puff system and NB#4 have been successfully connected to the DA-based control system.
- We have conducted experiments to control the electron density and the radial profile of electron temperature by the gas-puff and ECH with two separate heating positions (axis & ρ=0.4) .
- The density control was achieved by adjusting the frequency of pulsed gas-puff as shown in Fig. (d).
- In this system, 256 predictive simulations by TASK3D are running in parallel to compute the likelihood of each control input for the target state, while the model parameters are optimized by the observations . The control system estimated the ECH powers and gas-puff frequency to produce a target electron temperature and density.
- The electron density and temperature obtained by the real-time Thomson scattering measurement system ware assimilated every 0.3 s.
- We have confirmed that the control system works properly and successfully produced the target temperature and density as shown in Figs. (a)-(d).
- In the next experiment, we will try the multivariate control including electron temperature profile, ion temperature, and density by this system.

77-GHz Optical Vortex (OV) injection trial (S. Kubo)

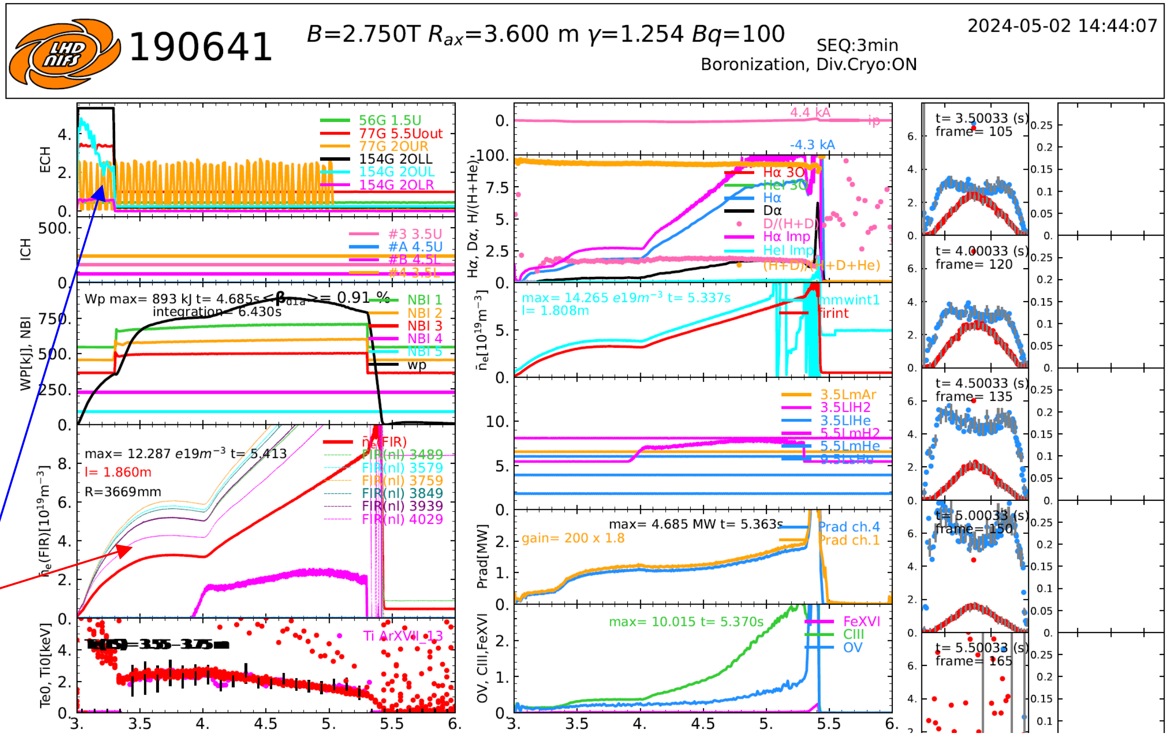
Experiment conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CW, 2.75 T, 1.2538, 100.0%)

Aim:

- Trial of the (l=2) optical vortex injection and find out the difference in the power deposition profile.

Results:

- Density ramp-up discharges from 1 to 7 x10^{19} m^{-3} with #1+#2+#3 N-NBIs(#190631-#190645) or #2+#3 N-NBIs(#190646-#190651) are maintained.
- 380 kW OV/normal O-mode were injected to identical discharges,(#190641/#190640) and (#190649/#190650) with 20 Hz modulation.
- Almost no difference in macroscopic plasma parameters were observed.
- Response of ECE due to the power modulation were observed for both OV/normal O-mode injections. Detailed difference in the ECE response to the modulated ECRH to be analised.



Raytrace for only normal O-mode available