(TC) Turbulence Topical Group Report

April. 2, 2023 (M. Nishiura)

Date: March 29, 2022
Time: 13:10 - 15:10
Shot#: 188554 – 188593 (40 shots)

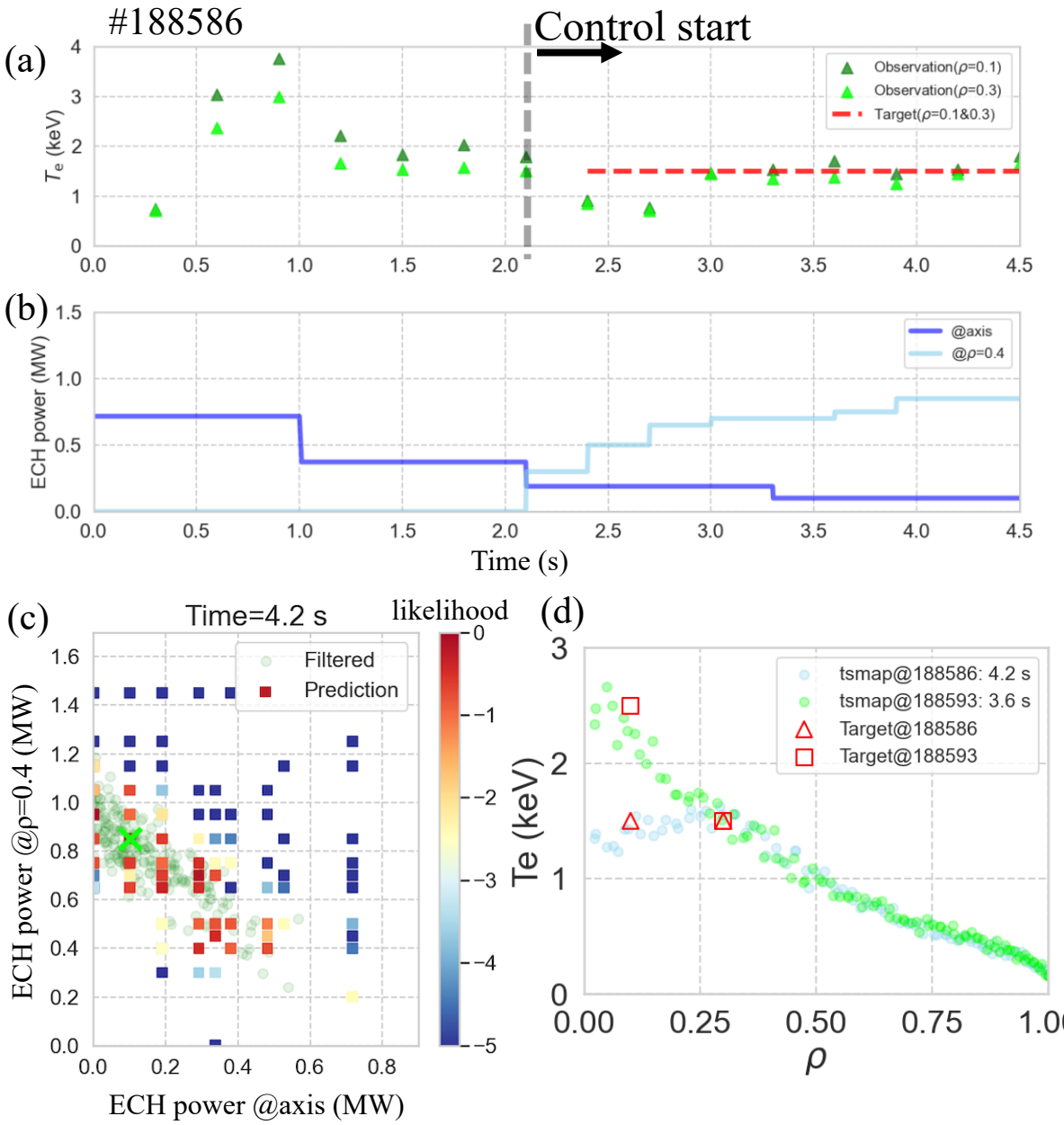
Prior wall conditioning: No
Divertor pump: ON
Gas puff: H2
Pellet: No
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(-, -, -, -, -)MW

ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(337, 380)kW
ECH(154GHz)=ant(2-OLL, 2-OUL , 2-OLR)=P(400, 450, 600)kW
ECH(56GHz)=ant(1.5U)=P(-)kW
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, Y. Morishita, N. Kenmochi)

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



Shot #: 188554 - 188593

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 profile control by the data assimilation-based control system .

Results:

- We have conducted experiments to control the radial profile of electron temperature by the ECH with two separate heating positions (axis & ρ=0.4) .
- The control system estimated the ECH powers to produce a target electron temperature at ρ=0.1 & 0.3. The electron density and temperature obtained by the real-time Thomson scattering measurement system ware used to optimize the thermal diffusivities in the prediction model (TASK3D).
- The gyrotrons #1 (337 kW) and #2 (380 kW) ware used for the heating at the axis, and the gyrotrons #4 (400 kW) , #5 (450 kW) , and #7 (600 kW) ware used for the heating at ρ=0.4.
- We have confirmed that the control system works properly as shown in Figs (a) and (b). The control system successfully produced the target temperature profiles as shown in Fig. (d).
- In this system, 256 TASK3D simulations are running in parallel to compute the likelihood of each control input for the target state as shown in Fig. (c), while the model parameters are optimized by the observations .
- In the next experiment, we will try to improve the performance of this profile control and include gas puff control.