

Real Time Electron Temperature Profile Control using NBI and EC in KSTAR

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Advanced operation modes require controls of plasma profiles to establish and to sustain the enhanced energy confinement and the non-inductive current fraction. Especially, an electron temperature (T_e) profile should be controlled to improve controllability of the q profile [1] as well as to keep the high plasma pressure. Recently, a real time T_e profile control system has been established and dedicated experiments have been carried out in KSTAR. The established T_e profile control system in KSTAR is composed of three parts. One is the controller for which a physics based non-adaptive control model is developed. The other is the state of T_e measured by EFIT and ECE in real time. Another is the actuator which consists of 0.3 MW 110GHz ECRH and 3.5 MW NBI. The dedicated control experiments have demonstrated the robustness of the T_e profile control system by using EC and NBI in both L- and H-mode plasmas. The experimental results have been analysed using CRONOS to figure out the way to improve the control performance. This work can be extended to integrated profile control in KSTAR and ITER.

References:

- [1] H.-S. Kim, "Role of Electron Temperature Control in Improved Safety Factor Profile Control in a Tokamak", Ph. D. Dissertation, Seoul National University (2015).