Progress Towards Achieving Profile Control in the Recently Upgraded DIII-D Plasma Control System*

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This paper describes the improvements being made in the capabilities of the DIII-D plasma control system (PCS) towards achieving optimization of pressure and current profiles in advanced tokamak discharges. Key improvements have been increased processing power and the ability to include profile diagnostic data. The recently completed upgrade of the PCS to Linux based Intel computers connected with 2 Gigabit/s Myrinet networking technology has been successful in achieving its goals of increasing the overall performance and flexibility of the system. The new Intel computing system has increased processing power by a factor 30 over the older i860 based systems. The Myrinet fiber based network has opened the doors to the inclusion of data in real-time from DIII-D diagnostics situated in remote locations within the DIII-D research facility. The PCS now collects 32 channels of motional Stark effect data and uses these data for real-time computation of the safety factor (q) profile. Electron temperature and density profile data from the Thomson scattering diagnostic and electron temperature profile data from the electron cyclotron emission diagnostic are in the midst of being added. Addition of ion temperature and toroidal rotation profile data from the charge exchange recombination diagnostic is planned. Feedback control from the PCS of the electron temperature at a single off-axis point has been demonstrated using either electron cyclotron heating (ECH) or neutral beam power. This has been used to modify current profile evolution during plasma current ramp up. Specifics of the latest improvements to the DIII-D PCS are detailed.

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