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Real Time Equilibrium Reconstruction for Control of the Discharge in the DIII-D Tokamak,¹ J.R. FERRON, M.L. WALKER, B. PENAFLORE, H.E. ST. JOHN, General Atomics — New discharge control techniques have been implemented for DIII-D that utilize an equilibrium reconstruction produced in real time. As in the computation-intensive equilibrium reconstruction code EFIT² (normally executed between discharges), the solution to the Grad-Shafranov equilibrium relation is found which best fits the diagnostic measurements. The distributions of current and poloidal flux are thus available in real time for accurate evaluation of the controlled discharge parameters. Shape control is implemented with the “isoflux” technique in which the poloidal flux at several locations defining the plasma boundary is calculated and coil currents are adjusted to keep the flux equal at all of these locations. The divertor X-point is located by calculating where $|B_p| = 0$. Shape identification with this reconstruction technique is robust to changes in β_p , l_i and edge current density. Development of the control technique for a new discharge shape is relatively rapid. By including Motional Stark Effect diagnostic data in the reconstruction, the safety factor profile can be determined in real time as is required for control of the current profile in advanced tokamak scenarios.

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²L.L. Lao, *et al.* Nucl. Fus. **25**, 1611 (1985)

Prefer Oral Session
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