Equilibrium Reconstruction of Detailed Current Density Profile Structure from External and Internal Magnetic Measurements in VEST

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A detailed current density profile structure is obtained in VEST by full equilibrium reconstruction from external and internal magnetic measurements. Vertical component of the magnetic field is measured by magnetic Hall sensors from inside the plasma, in addition to the typical external magnetic diagnostics. Grad-Shafranov equation solver TEFIT is modified to incorporate internal magnetic, external magnetic and diamagnetic measurements. The reconstructed equilibrium parameters are compared to the discharge characteristics of VEST to check the consistency of the result. It is shown that with the internal magnetic probe data, the uncertainty of the current density profile by equilibrium reconstruction is reduced. From the reconstructed current density data, the transition from hollow to peaked profile is observed, which is a typical phenomena during a current ramp up in a tokamak. The current penetration phenomena will be discussed in more detail with the established equilibrium reconstruction procedure including the internal magnetic probe data in addition to the typical external magnetic diagnostics.