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MHD Studies of Advanced Tokamak Equilibria E. STRUMBERGER, S. GUENTER, E. SCHWARZ, C. TICHMANN, Max-Planck-Institut f. Plasma Physik, IPP-Euratom Association — Advanced tokamak scenarios are often characterized by an extremely reversed profile of the safety factor, q, and a fast toroidal rotation. ASDEX Upgrade type equilibria with toroidal flow are computed up to a toroidal Mach number of $M_{\rm ta} = 0.5$, and compared with the static solution. Using these equilibria, the stabilizing effect of differential toroidal rotation on double tearing modes (DTMs) is investigated. These studies show that the computation of equilibria with flow is necessary for toroidally rotating plasma with $M_{\rm ta} \geq 0.2$. The use of $\rho_{\rm tor}$ instead of $\rho_{\rm pol}$ as radial coordinate enables us also to investigate the stability of equilibria with current holes. For numerical reasons, the rotational transform, $\iota = 1/q$, has to be unequal zero in the CASTOR_FLOW code, but values of $\iota_{\rm a} \geq 0.001$ ($q_{\rm a} \leq 1000$) can be easily handled. Stability studies of DTMs in the presence of a current hole are presented. Tokamak equilibria are only approximately axisymmetric. The finite number of toroidal field coils destroys the perfect axisymmetry of the device, and the coils produce a short wavelength ripple in the magnetic field strength. This toroidal field ripple plays a crucial role for the loss of high energy particles. Therefore, three-dimensional tokamak equilibria with and without current holes are computed for various plasma beta values. In addition the influence of the plasma beta on the toroidal field ripple is investigated.

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