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MHD stability of ITER H-mode confinement with pedestal bootstrap current and diamagnetic effects taken into account

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MHD stability of ITER H-mode confinement is investigated with bootstrap current included for equilibrium, together with diamagnetic drift and rotation effects for stability. The ITER pedestal has high temperature, so the bootstrap current is large and diamagnetic effects are important. We construct numerically ITER equilibria with bootstrap current taken into account.Especially, we have considered a more realistic scenario in which density and temperature profiles can be different. The direct consequence of bootstrap current effects on equilibrium is the modification of local safety factor profile at pedestal, so that the magnetic shear can be reduced or reversed locally. This local q value is referred to as q_s. This q profile change results in a dramatic change of MHD mode behavior. The stability of ITER numerical equilibria is investigated with AEGIS code. Both low-n and peeling-ballooning modes are investigated. Note that pressure gradient at pedestal is steep. High resolution computation is needed. Since AEGIS code is an adaptive code, it can well handle this problem. Also, the analytical continuation technique based on the Cauchy-Riemann condition of dispersion relation is applied, so that the marginal stability conditions can be determined. It is found that the pedestal stability depends not only on the edge current (J_{ped}) and pressure gradient (p'_{ped}), but also on the q_s value. This shows that the pedestal stability can be affected by the global current profile. The diamagnetic drift and rotation effects are also investigated. Both numerical scheme and results will be presented. The physical interpretation will be explained.

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