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P2.1019 Effect of applied resonant magnetic perturbations on local plasma current density gradient and stability of m/n=2/1 magnetic island

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The effect of externally applied resonant magnetic perturbations (RMPs) on the plasma current density gradient in the vicinity of resonant surfaces is investigated, based on two-fluid equations. In our paper we focus on m/n=4/2 or 6/3 RMPs. RMPs of moderate amplitude (~ 10-4 - 10-3 of the toroidal field) are found to be able to generate a significant change in the local m/n=0/0 component plasma current density gradient around the q=2 resonant surface, in addition to small 4/2 or 6/3 magnetic islands. The changes in the current density profile affect the stability of 2/1 magnetic islands. As an example we show that the growth of a 2/1 NTM, driven by both an unfavorable plasma current density profile and a bootstrap current perturbation, can be suppressed by a static RMP. Without applying RMPs, the NTM saturates at a width of 0.2a (a is the plasma minor radius). The 2/1 mode can be suppressed by static m/n=4/2 or 6/3 RMPs of moderate amplitude if the local electron fluid velocity at the resonant surface is sufficiently large. The influence of other plasma parameters, such as plasma resistivity/temperature, diamagnetic drift frequency and electron inertia, are also studied. We find in particular that higher plasma temperatures favour the stabilizing effect of external RMPs, suggesting a possible way to improve the 2/1 mode stability in ITER, considering that the 2/1 mode is one of the major causes for disruptions in tokamak discharges.

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