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TH/P4-09: Penetration of Resonant Magnetic Perturbations in Turbulent Edge Plasmas with Transport Barrier

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In the context of edge localized mode (ELM) control by resonant magnetic perturbations (RMPs), the impact of micro-turbulence on the RMP penetration process and effectiveness is an important issue. Indeed, on the one hand, theoretical investigations as well as quasi-linear and non-linear MHD modeling reveal that the magnetic perturbation is strongly screened by plasma rotation. On the other hand, micro turbulence that is unavoidably present at the plasma edge, governs transport processes and strongly interacts with sheared plasma rotation. In this work, we study the penetration of RMPs by means of numerical simulations with different turbulence models and geometries. First, using a simplified reduced MHD model in the EMEDGE3D code, the plasma response to RMPs is studied in three-dimensional tokamak geometry with flux driven micro turbulence and a transport barrier induced by sheared plasma rotation. Second, the magnetic field penetration is studied in the framework of a two-dimensional two-fluid model including diamagnetic effects. In both models, a helical magnetic perturbation is induced at the plasma boundary and necessary numerical techniques have been developped to avoid generation of artificial courant at the boundary. In a third part of this work, we study in the frame of a two fluid model the interaction between an pre existing magnetic island and small scale turbulence propagating towards this island.

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