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Three-Dimensional Efffects in Tokamaks[1] E. STRUMBERGER, S. GUENTER, P. MERKEL, M. SEMPF, D. TEKLE, Max-Planck-Institut fuer Plasmaphysik — Although tokamak plasmas are usually considered to be axisymmetric, 3D effects become more and more important. Possible causes for the symmetry breaking are i.) the finite number of toroidal field coils, ii.) superimposed, slowly varying helical fields that serve for edge localized mode (ELM) control, iii.) island formation due to neoclassical tearing mode (NTM) activity, iv.) 3D wall structures necessary for the stabilizing of resistive wall modes (RWMs), etc. For the ITER scenario 2, we study fast particle losses caused by field ripple, helical fields and low-frequency field perturbations, and find a synergetic effect. Realistic resistive walls, such as the planned ITER and the ASDEX Upgrade walls, have a complex three-dimensional shape including holes and tubular extensions. Using the improved and successfully benchmarked 3D ideal MHD STARWALL code, we find coupling of different toroidal RWM modes caused by 3d wall structures. It appears that these walls also break the degeneracy of +/-n modes and give rise to two eigenmodes with similar but distinct growth rates.

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