MHD Simulation of Resonant Magnetic Perturbations

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Resonant magnetic perturbations (RMP) have been found effective in suppressing ELMs in the DIII-D experiment. [1] The experimental temperature profile is found to be less affected by the RMP than the density profile. Simulations with the M3D code [2] indicate that plasma rotation has an essential effect on the RMP. When rotation is below a threshhold, the magnetic field is similar to the vacuum field, stochastic in the outer part of the plasma. As expected, the temperature is strongly affected, Fig.(a) while the density is modified only slightly. At higher rotation speed, the stochastic layer is thinner. The temperature can maintain a gradient across this layer, Fig.(b), an effect which has been observed in stellarators. The density is affected by the greater rotation and experiences enhanced loss. Two fluid and MHD models give similar results. The scaling of the critical rotation and relevance to ITER will be presented.

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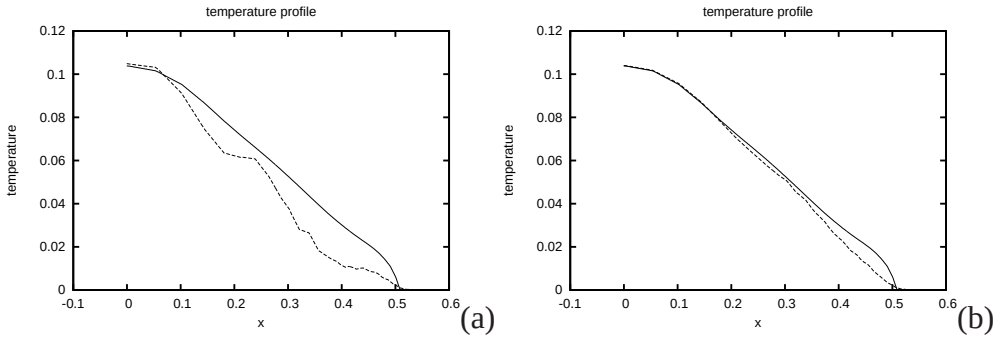

(a) initial and later time temperture profiles with lower rotation with applied RMP (b) initial and later time temperture profiles with higher rotation.

[1] T. E. Evans, *et al.* Phys. Plasmas **13**, 056121 (2006).

[2] W. Park, E.V. Belova, G.Y. Fu, X. Tang, H.R. Strauss, L.E. Sugiyama, Phys. Plasmas **6**, 1796 (1999).