Gyrokinetic parameter scan of GAMs close to L-H transition threshold

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In recent gyrokinetic simulations for Textor [1] with the ELMFIRE code [2], strong GAM activity was observed for L-mode parameters but not for H-mode. Similar behaviour has been observed in AUG experiments where clear GAM oscillations were seen before L-H transition [3]. To study the effect of GAMs on $E \times B$ shear, parameter scans over density, temperature, gradient scale lengths L_n and L_T, isotope and magnetic field are carried out varying parameters close to typical L-H transition conditions. In the simulations, shear values due to GAM oscillation temporarily achieve values which exceed the BDT criterion for strong turbulence suppression [4], but as the effective shear due to oscillating E_r is much lower [5], no clear effect of shear due to GAMs on transport has been observed. However, E_r itself correlates with turbulent heat and particle fluxes. For radial wavelength of GAMs, in the collisional regime experimental and simulation results were shown to agree with each other [6] while they did not agree with analytic theory [7]. In the present paper, we show in the low collisional regime that the agreement between theory and the simulations is good. The speed of the radial GAM propagation is shown to roughly scale as $v_{r,GAM} \propto v_t$ which is in qualitatative agreement with Ref. [8] where the propagation velocity of GAMs was shown to decrease with decreasing temperature. The effect of gradient scale lengths is also tested by using hyperbolic profiles and changing L_T and L_n while keeping temperature and density fixed at the middle of the gradient. Here, clear increase of χ_e is observed when steepening density gradient which clearly affects GAMs.
Acknowledgements: This work is supported by EFDA-HLST and is part of the national TEKES work programme. CSC – IT Center for Science Ltd., PRACE and HPC for Fusion are acknowledged for the allocation of computational resources for this work.

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