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Relevance of the ITG Localized Modes to the Accretion Theory of Angular Momentum "Generation"*

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The accretion theory [1] of the spontaneous rotation phenomenon discovered in magnetically confined axisymmetric plasmas has been quite successful in accounting for the most recent experimental observations. We note that experiments [2, 3] on the evolution of the radial velocity profile have confirmed some of the key predictions of the theory, particularly that the source of the rotation is at the edge of the plasma column and that the rotation propagates toward the center of the plasma column at a faster rate than predicted from the collisional transport theory. This is consistent with the assumption made within the accretion theory that Ion Temperature Gradient (ITG) driven modes, whose growth rates are enhanced by the radial gradient of the toroidal velocity in the outer region of the plasma column, are responsible for the inward momentum transport.

The relevance to the accretion theory of the ITG modes localized by the shear of the magnetic field is discussed. The role of the spectrum of the excited modes is addressed. It is demonstrated that this type of instabilities can successfully account for the inward transport of the angular momentum and outward transport of the thermal energy.

Some results of the ongoing work on a more detailed comparison of the theory with experiments are presented. Particularly, we use a model l-D transport equation to simulate the evolution of the velocity profile during the transition as well as in the quasi-stationary phase of the discharge and estimate the magnitudes of the relevant diffusion coefficient and angular momentum inflow. These results are compared with the quasi-linear estimates of the transport coefficients evaluated for the relevant ITG modes.

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[1] B. Coppi, *Nucl. Fus.*, **41**, 12, 1 (2002)
[2] J.E. Rice et al., in Proceedings of the 2002 International Conference on Fusion Energy, Paper EX/C3-7Ra (Publ. I.A.E.A., Vienna, 2002)
[3] E.S. Marmar et al., in Proceedings of the 2002 International Conference on Fusion Energy, Paper OV/4-1 (Publ. I.A.E.A., Vienna, 2002)