

1E06

Generation of zonal flows and fields in tokamak edge plasmas: application to DIII-D and effects of ion temperature

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Recently we have developed a theory for the generation of zonal flow and field driven by finite \square drift waves and have obtained a criterion for L-H transition in tokamaks [1] and have applied it specifically to DIII-D [2]. The predicted threshold based on this theory shows very good agreement with edge measurements on discharges undergoing L-H transitions in DIII-D. The observed differences in the transitions with the reversal of the toroidal magnetic field are reconciled in terms of this criterion. The theory also provides an explanation for lowered threshold power, pellet injection H modes in DIII-D, thereby unifying seemingly unconnected methods for accomplishing the transition. The earlier theory was for zero ion temperature. We have extended the theory to include finite temperature effects. The modified criterion retains the same basic dependences on the crucial parameters for the transition. For the specific case when $T_i/T_e=1$, the threshold electron temperature is reduced and the scaling with plasma parameters remains exactly the same as that derived in our earlier work [2].

¹P. N. Guzdar et al., Phys. Rev. Lett. **87**, 015001 (2001).

²P. N. Guzdar et al., Phys. Rev. Lett. **89**, 265004 (2002).