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Gyrokinetic studies of electrostatic drift instability driven by fast ion precession in burning plasmas

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It was found that the electrostatic drift instability can be driven by the resonance between reversed toroidal precession of the high energy trapped ions and the electron drift wave in a tokamak[1] from a local stability analysis using gyrokinetic equations in toroidal geometry.[2,3] Various properties and turbulence transport of the new instability were investigated by gyrokinetic simulations[4,5] using GKW code.[6] Further physics of turbulence driven by the new instability is being elucidated. The contribution from nonadiabatic passing fast ions in reversed shear plasmas which was neglected in the previous research have been calculated using gyrokinetic equations. Nonadiabatic barely passing fast ions can also influence the instability mainly in weakly negative shear regime. In order to explore the physics of the instability, various properties of the instability are investigated using gyrokinetic simulation using GKV code.[7] The results obtained by GKV code has been compared with previous results obtained by GKW code. The nonlinear physics such as turbulence heat transport property has been investigated.

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