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# EFFECT OF MAGNETIC SHEAR AND EQUILIBRIUM FLOWS ON COLLISIONLESS MICROTEARING AND MIXED PARITY MODES IN HOT TOKAMAK PLASMAS

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Turbulent transport of energy, particles and momentum is one of the important limiting factors for long time plasma confinement. Modern kinetic study using gyrokinetic formalism and simulation has progressed to identify several microinstabilities that cause ion and electron thermal transport. Typically, these have been ballooning parity modes such as the ITG, KBM and ETG modes which cause transport through fluctuations or tearing parity modes such as Microtearing modes (MTM) which change the local magnetic topology and cause transport through stochastization of the magnetic field. Local gyrokinetic simulations have found collisional MTMs unstable in several magnetic confinement configurations such as Spherical Tokamaks, Reverse Field Pinch and Standard Tokamaks. Aditya K Swamy et al. [Phys. Plasmas 21 (2014), 22 (2015)] have found global Collisionless MTMs to be linearly unstable in regions high positive magnetic shear. The collisionless MTM is found to be driven unstable by the magnetic drift resonance of passing electrons.

In this work, we address the complex multiscale problem of MTM stability in advanced tokamak scenarios which envisage reversed magnetic shear with observed strong sheared poloidal and toroidal flows in the Internal Transport Barrier. In the first part of this work, safety factor profiles are continuously varied parametrically from standard shear profiles to weak and reverse shear profiles. Multiple MTM modes are found at finite positive shear. As the global safety factor profile is varied, novel mixed parity modes of MTMs are found to become unstable with weak shear. In the second part, the effect of equilibrium flows are studied for their effect on MTM and mixed parity (MP) instabilities and their global mode structures. These and several other characteristics of MTMs and Mixed Parity modes will be reported.

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