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Effect of Rotation Shear on MHD Modes in Tokamaks with Low Magnetic Shear

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In tokamaks with low magnetic shear, the Alfvén wave can be substantially modified by the variation of the toroidal rotation velocity across the plasma surface. First, the location of Alfvén resonance of the MHD mode within the plasma is modified by the rotation shear. The location is determined by both the overall mode structure and the local rotation shear, and the region which provides instability drive to the MHD mode can be enlarged or reduced. Second, the Alfvén wave restoring force is substantially weakened over a low shear region, when the shearing rate of the rotation frequency matches with the shearing rate of the local Alfvén frequency. Because the plasma rotation frequency is usually much smaller than the Alfvén frequency, substantial modifications of the Alfvén stability only occur in weak magnetic shear tokamak plasmas driven by strong tangential neutral beam injection.

The effect of rotation shear on MHD modes in a reversed shear tokamak is examined. It is found that (I) rotation shear has a stabilizing effect on the finite beta double kink [1] localized between two mode resonant surfaces; and (II) the flow shear has a destabilizing effect on MHD modes localized within the central reversed shear region. Following the analysis provided in Ref. 1, these effects are extracted analytically. Numerical results from the MARS code confirm this analytic expectation. This will also be presented.

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[1] C.G. Gimblett, R.J. Hastie, and T.C. Hender, Phys. Plasmas **3**, 3369 (1996).

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