Double tearing modes in the presence of anti-symmetric shear flow

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The linear properties of both even and odd double tearing modes (DTMs) in the presence of plasma shear flow are studied based on a reduced resistive MHD model in slab geometry. It is found that for the symmetric shear flow, the linear growth rate of even eigenmode of DTM is almost independent of the strength of shear flow, while the odd eigenmode decreases with the shear flow strength. However, for anti-symmetric shear flow, the linear growth rates of even (odd) eigenmode of DTM decrease (increase) with increasing the strength of shear flow. Moreover, in the small wavenumber regime, the growth rate of the even eigenmode is larger than that of the odd eigenmode, while the growth rates of two kinds of eigen states coalesce with each other (the same growth rate and opposite frequencies) when the wavenumber exceeds a critical value Kc. It is demonstrated that Kc decreases with decreasing resistivity for a fixed separation between two resonant surfaces Xs, while decreasing Xs raises the critical value of Kc for a fixed shear velocity. In the nonlinear regime for a low value of resistivity, it is observed that the formation of plasmoids changes gradually, by increasing the strength of anti-symmetric shear flow.