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Low frequency perturbations of anisotropic thin current sheets in collisionless plasma

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The stability of the new class of current sheet (CS) equilibrium, i.e. the anisotropic thin current sheet, is considered. This new equilibrium is different from the isotropic case like Harris model. The question of stability of thin CS is a serious problem. Earlier it was shown that tearing-mode in isotropic CS with nonzero normal component of the magnetic field is stable due to stabilization effect of the electron compressibility. The linear Vlasov theory of anisotropic CS stability at low frequency magnetic perturbations ($\omega/k << c$) is presented. It is shown that equilibrium model has much more free energy than Harris one, therefore it might be unstable. Also we investigated the development kink-like instability (symmetrical and asymmetrical modes). These two kinds of perturbation: $k = k_x e_x$(tearing mode) and $k = k_y e_y$ (kink mode) are the most important objects of a theory of stability in the space plasma. We consider the symmetric and asymmetric perturbations with various values of the angle $\theta = \arctan(k_y/k_x)$. We have estimated that the growth rate of instability γ and the real part of perturbation frequency ω_r as functions of both the angle θ and the value of a wave number $k = \sqrt{k_x^2 + k_y^2}$. It is shown that the anisotropic thin CS can be unstable relatively tearing perturbation at different values of the angle θ.