Stability and instability of plasma boundary layers

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摘要： We investigate mathematically a plasma boundary layer near the surface of materials immersed in a plasma, called a sheath. From a kinetic point of view, Boyd-Thompson proposed a kinetic Bohm criterion which is required for the formation of sheaths. Then Riemann pointed out (although without a rigorous proof) that the criterion is a necessary condition for the solvability of the stationary Vlasov-Poisson system. Recently, Suzuki-Takayama analyzed rigorously the solvability of the stationary Vlasov-Poisson system, and clarified in all possible cases whether or not there is a stationary solution. It was concluded that the Bohm criterion is necessary but not sufficient for the solvability. In this talk, we study the nonlinear stability and instability of the stationary solutions of the Vlasov-Poisson system. The location of the support of the initial data is a major factor leading to stability/instability. This talk is based on a joint work with Professor M. Takayama (Keio Univ.) and Professor K. Z. Zhang (Northeastern Univ.).