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The Hot, Magnetized Relativistic Maxwell Vlasov System

Fusion energy is at the threshold of becoming one of the most green and sustainable energy sources in the world. This energy is creating by heating an ionized gas (plasma) to extreme temperatures in order to allow high energy particle collisions to occur. This leads to an exothermic fusion reaction releasing immense energy to be harvested. One major hurdle, is the plasma is highly pressurizes and must be contained within a reactor. A solution to this issue is applying a strong magnetic field which traps the particles from escaping radially outwards from the confinement chamber. Such a system can be modeled mathematically by the Hot, Magnetized, Relativistic Vlasov Maxwell (HMRVM) system. A small physically pertinent parameter ϵ, with $0 < \epsilon \ll 1$, related to the inverse of a gyrofrequency, governs the strength of a spatially inhomogeneous applied magnetic field given by the function $x \mapsto \epsilon^{-1}\mathbf{B}_e(x)$. Stationary (equilibrium) solutions to this system are well understood, but it is not clear how perturbations from equilibrium could lead to destabilization of the plasma (the plasma explodes releasing uncontrollable energy). It has been recently in shown that, in the case of *neutral*, *cold*, and *dilute* plasmas (like in the Earth's magnetosphere), smooth solutions corresponding to perturbations of equilibria exist on a uniform time interval $[0, T]$, with $0 < T$ independent of ϵ. In this talk we further extend these results to hot plasmas for well prepared initial data.