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Sharp nonlinear stability criterion for Relativistic Vlasov-Maxwell system. Preliminary report.

Vlasov-Maxwell systems is the kinetic model for collisionless plasmas. We study the stability and instability of symmetric equilibria for this system under symmetric perturbations. For a large class of equilibria, sharp criterion for linear stability is found for fully 3D case and other simpler models. The nonlinear instability can be proved from linear instability, for the so called one and one half case. We also prove nonlinear stability from the sharp linear stability criterion for purely magnetic equilibria in the one and one half case. We will sketch these results (joint work with Walter Strauss). Then the proof of nonlinear instability will be sketched. Several new ideas are introduced in this proof which greatly extend the usual energy-Casimir argument. We believe these ideas are applicable in passing from linear to nonlinear stability for other infinitely dimensional Hamiltonian systems. (Received January 25, 2005)