# Kinetic Model for Solitons in Magnetized Relativistic Electron-Positron Plasmas

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The study of wave propagation in relativistic electron-positron plasmas is of importance to understand various processes such as pulsar emission or acceleration of relativistic jets. Relativistic effects introduce several sources of nonlinearity which must be considered to properly model the plasma in these cases: large quiver velocities of particles in the wave field; very large temperatures; and large wave amplitudes.

We have previously studied the propagation of circularly polarized waves along a constant background magnetic field in pair plasmas, considering all three sources of nonlinearity. Using a fluid model, we have shown that a circularly polarized wave is an exact solution of the equations describing a magnetized plasma, with relativistic temperatures. We have also studied kinetic models, either considering thermal effects along the background magnetic field, and, more recently, considering all three directions in velocity. [1,2]

We have studied various nonlinear effects such as parametric decays [1] and the existence of envelope solitons, [3,4] comparing this with relativistic particle-in-cell simulations. [1] Although results are consistent in general, preliminary studies show some disagreement between the fluid model and the particle simulations when dealing with soliton propagation, suggesting that a kinetic model for solitons in these plasmas is necessary.

In this work we present preliminary results along these lines. Starting from Vlasov and Maxwell's equations, a nonlinear equation for the envelope can be obtained (see, *e.g.*, Ref. [5]), whose solutions can be compared to both the fluid treatment and the outcome of particle simulations.

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