Thermal effects on the propagation of large-amplitude electromagnetic waves in magnetized relativistic electron-positron plasma

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The propagation of circularly polarized electromagnetic waves along a constant background magnetic field in an electron-positron plasma is calculated by means of both a fluid and a kinetic theory treatment. In the fluid theory, relativistic effects are included in the particle motion, the wave field, and in the thermal motion by means of a function f, which depends only on the plasma temperature. In this work we analyze the consistency of the fluid results with those obtained from a kinetic treatment, based on the relativistic Vlasov equation. The corresponding kinetic dispersion relation is numerically studied for various temperatures, and results are compared with the fluid treatment. Analytic expressions for the Alfvén velocity are obtained for the fluid and kinetic models, and it is shown that, in the kinetic treatment, the Alfvén branch is suppressed for large temperatures.