Kinetic effects on the parametric decays of Alfven waves in relativistic pair plasmas

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Parametric decays of a circularly polarized wave propagating along a constant magnetic field in an electron-positron plasma are studied. Fully relativistic effects on the particle velocity in the wave field are considered, as well as kinetic effects in the longitudinal direction, by means of a one-dimensional relativistic Vlasov equation. In this approximation, dispersion relations are found for the pump wave and its parametric decays. The pump wave dispersion relation is basically the nonrelativistic one, with a decreased plasma frequency. The dispersion relation for the parametric decays shows couplings between normal modes of the system, namely transverse sideband modes and Langmuir waves. This dispersion relation is then solved numerically in the weakly relativistic regime, where the distribution function can be taken to be a Maxwellian. This is done by using a graphical method, which has the advantage of showing explicitly the various modes involved in the decays, making thereby the physical picture more transparent.