On plane waves in diluted relativistic cold plasmas

Gaetano Fiore¹,
¹Dip. di Matematica e Applicazioni, V. Claudio 21, 80125 Napoli, Italy

We consider the exact microscopic equations ruling a relativistic cold plasma after the plane-wave Ansatz. We show that the motion of a very diluted plasma initially at rest and excited by a given purely forward (or backward) transverse plane wave has a disarmingly simple and explicit expression in terms of the transverse electromagnetic potential $A^\perp(x - ct)$, valid for all profiles and intensities of the latter. We also mention the relevance of these results for understanding the acceleration mechanisms of charged particles (in particular, electrons) by nowadays available very short and intense laser pulses.