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Field-particle dynamics for the kinetics of the chiral phase transition

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We simulate the kinetics of the chiral phase transition in hot and dense strongly interacting matter within a novel kinetic-theory approach. Employing an effective linear σ model for quarks, σ mesons, and pions we treat the quarks within a test-particle ansatz for solving the Boltzmann transport equation and the mesons in terms of classical fields. The decay-recombination processes like $\sigma \leftrightarrow \bar{q} + q$ are treated using a kind of wave-particle dualism using the exact conservation of energy and momentum. After demonstrating the correct thermodynamic limit for particles and fields in a "box calculation" we apply the simulation to the dynamics of an expanding fireball similar to the medium created in ultrarelativistic heavy-ion collisions.

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