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Electromagnetic Field Effects on Hydrodynamic Simulations

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The ultrarelativistic motion of charges in heavy-ion collisions is responsible for generating extreme electromagnetic fields, with magnetic fields of the order of 10^{18} G (for RHIC energies). However, the fields are very short-lived and their effects on the dynamics of the hot and dense matter produced in the collision are not well understood. In this work, we use a hybrid simulation chain, to investigate the effects that the electromagnetic field generated by the charged participants and the charged fluid on the hydrodynamic evolution itself. The initial conditions for the energy-momentum tensor are constructed using the AMPT model [2, 3], while the electromagnetic field is obtained by separating the contribution from the spectators, calculated analytically, from that generated by the fluid [4], where the net electric four-current is determined from the divergence of the fluid electromagnetic tensor. The evolution of the fluid is solved using a newly developed 3+1D hydrodynamic code. The effects of the magnetic field produced by the fluid are studied using a relativistic resistive magnetohydrodynamics approach.

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