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Impact of globally spin-aligned vector mesons on the search for the chiral magnetic effect in heavy-ion collisions

In high-energy heavy-ion collisions, the chiral magnetic effect (CME) is predicted to arise from the interplay between the chirality imbalance of quarks in the nuclear medium and the intense magnetic field, and will cause a charge separation along the magnetic field direction. While the search for the CME is still ongoing in experiments at Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC), the CME-sensitive observables need to be scrutinized to exclude the non-CME contributions. In this work, we examine the influence of globally spin-aligned ρ mesons on the γ_{112} correlator, the $R_{\Psi_2}(\Delta S)$ correlator, and the signed balance functions, via a toy model and a multiphase transport model (AMPT). The global spin alignment of vector mesons could originate from non-CME mechanisms in heavy-ion collisions, and is characterized by the 00-component of the spin density matrix, ρ_{00}. We find that the CME observables show similar dependence on ρ_{00}, and could receive a positive (negative) contribution from ρ-decay pions, if the ρ_{00} of ρ mesons is larger (smaller) than 1/3. Since pions are the most abundant particles in such collisions, the ρ_{00} measurements for ρ mesons become crucial to the interpretation of the CME data.

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