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Transverse spherocity dependence of azimuthal anisotropy in heavy-ion collisions at the LHC using a multi-phase transport model

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One of the event shape observables, the transverse spherocity (S_0), has been studied successfully in small collision systems such as proton-proton collisions at the LHC as a tool to separate jetty and isotropic events. It has unique capability to distinguish events based on their geometrical shapes. In our work, we report the first implementation of transverse spherocity in heavy-ion collisions using a multi-phase transport model (AMPT). We have performed an extensive study of azimuthal anisotropy of charged particles produced in heavy-ion collisions as a function of transverse spherocity (S_0). We have followed the two-particle correlation (2PC) method to estimate the elliptic flow (v_2) in different centrality classes in Pb-Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV for high-S_0, S_0-integrated and low-S_0 events. We have compared the results obtained from AMPT and PYTHIA8 (Angantyr). It is found that two-particle elliptic flow ($v_{2,2}$) is almost zero in the latter one and it is almost free from residual non-flow effects. Also, transverse spherocity does not introduce any bias to the system as far as the elliptic flow is concerned, which is clear from the comparison between the two models. We found that transverse spherocity successfully differentiates heavy-ion collisions'event topology based on their geometrical shapes i.e. high and low values of spherocity (S_0). The high-S_0 events are found to have nearly zero elliptic flow while the low-S_0 events contribute significantly to elliptic flow of spherocity-integrated events.

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