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Correlation between initial spatial anisotropy and final momentum anisotropies in relativistic heavy ion collisions

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The momentum anisotropy (v_n) of the produced particles in relativistic nuclear collisions is considered to be a response of the initial geometry or the spatial anisotropy (ε_n) of the system formed in these collisions. The linear correlation between ε_n and v_n measures the efficiency at which the initial spatial eccentricity is converted to final momentum anisotropy in heavy ion collisions. We have studied the transverse momentum, collision centrality, and beam energy dependence of this correlation for different charged particles using a hydrodynamical model framework MUSIC. The (ε_n – v_n) correlation is found to be stronger for central collisions and also for n=2 compared to that for n=3 as expected. However, the transverse momentum (p_T) dependent correlation coefficient shows interesting behaviour which strongly depends on the mass as well as p_T of the produced particles. The correlation strength is found to be larger for lighter particles in the lower p_T region. We have seen that the relative fluctuation in anisotropic flow depends strongly in the value of η/s specially in the region $p_T < 1$ GeV unlike the correlation coefficient which does not show significant dependence on η/s

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