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Anisotropic flows and the shear viscosity of the QGP within an event by event transport approach

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We study the build up of elliptic flow v_2 and high order harmonics v_3, v_4 and v_5 for a fluid at fixed η/s by mean of an event-by-event transport approach. We study the effect of the η/s ratio on the build up of the $v_n(p_T)$. In particular we study the effect of a temperature dependent η/s for two different beam energies: RHIC for Au+Au at $\sqrt{s} = 200\,GeV$ and LHC for $Pb + Pb$ at $\sqrt{s} = 2.76\,TeV$. We find that for the two different beam energies considered the suppression of the $v_n(p_T)$ due to the viscosity of the medium have different contributions coming from the cross over or QGP phase. In ultra-central collisions the $v_n(p_T)$ show a strong sensitivity to the η/s ratio in the QGP phase and this sensitivity increase with the increase of the order of the harmonic. Moreover, we discuss the correlation between the initial spatial anisotropies ϵ_n and flow coefficients v_n. We find that at LHC energies the v_n are more correlated to the initial ϵ_n respect to RHIC energies.
We find that the elliptic flow v_2 is strongly correlated with initial eccentricity ϵ_2. While higher harmonics v_3, v_4 and v_5 are weakly correlated to their asymmetry measure in coordinate space ϵ_3, ϵ_4 and ϵ_5. The degree of correlation increase with the impact parameter. At LHC energies and in ultra-central collisions we find that the linear correlation coefficent $C(n,n) \approx 1$ for $n = 2, 3, 4$ and 5.

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