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Anisotropie v_n nello spazio degli impulsi e fluttuazioni di stato inziale nel plasma creato nelle collisioni ad energie ultra-relativistiche

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Summary

Heavy Ion Collisions at ultra-relativistic energies represent the only possibility to explore the QCD phase diagram in laboratory. One of the most important observable which encode information about the matter created in these collisions is the elliptic flow v_2 which is a measure of the azimuthal anisotropy in momentum space. In recent years several analisys have been devoted to study more refined features of the particle distribution extending the study to the anisotropic flow coefficients to the n-th harmonic v_n. We discuss the build up of the anisotropic flows v_n for a fluid at fixed $\eta/s(T)$ in the framework of an event-by-event transport approach [1]. Such an approach, as shown in [2], recovers the universal features of the ideal hydrodynamics. In particular, we discuss the role of the Equation of State and the effect of the η/s and its temperature dependence on the build up of the $v_n(p_T)$. We find that only in ultra-central collisions $(0-0.2\%)$ the $v_n(p_T)$ have a stronger sensitivity to the T dependence of η/s in the QGP phase and this sensitivity increases with the order of the harmonic n. Moreover, the study of the correlations between the initial spatial anisotropies and the final flow coefficients reveals that at LHC energies there is much more correlation than at RHIC energies and the degree of correlation increases from peripheral to central collisions. In ultra-central collisions at LHC a linear correlation coefficent $C(n,n) \sim 1$ for n=2,3,4 and 5 is found and entailing that the (v_n, v_m) correlations supply an image of the initial space correlations (ϵ_n, ϵ_m) between different harmonics in the eccentricities. Finally, we discuss in ultra-central collisions the structure of the integrated (v_n,n) plot and its relation with Equation of State and kinetic freeze out dynamics.

[1] S. Plumari, G. L. Guardo, F. Scardina, V. Greco, Phys.Rev. C92 (2015) no.5, 054902.
[2] S. Plumari, G. L. Guardo, V. Greco, J.-Y. Ollitrault, Nucl.Phys. A941 (2015) 87-96.

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