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Probing pT-dependent flow vector fluctuations with ALICE

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One of the main goals of ultra-relativistic nuclear collisions is to create a new state of matter called quark-gluon plasma (QGP) and study its properties. One of the experimental observables is the anisotropic flow v_n, defined as correlation of azimuthal angle of each particle with respect to a common symmetry plane Ψ_n. The v_n and Ψ_n represent the magnitude and the phase of a complex flow vector V_n, respectively. Azimuthal anisotropies are traditionally measured using 2- and/or multi-particle correlations over a large range in $p_{\rm T}$ and η. However, hydrodynamic calculations show that the event-by-event fluctuations in the initial conditions and the dynamics during the system expansion lead to flow vector fluctuation in $p_{\rm T}$ and/or η (also called de-correlations of flow vector), including flow magnitude and flow angle fluctuations.\\ In this talk, we present the evidence of $p_{\rm T}$-dependent flow vector fluctuations in Pb–Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV, using both $v_n\{2\}/v_n[2]$ and r_n observables. In addition, newly proposed four-particle correlations are used to study the contributions of flow magnitude and flow angle fluctuations separately. Considering that the size of flow vector fluctuations is sensitive to both initial conditions and the properties of the created QGP, these measurements will help us better constrain hydrodynamic models.

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