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Probing flow fluctuations through factorization breaking in heavy-ion collision

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The collective flow of particles, generated in the expansion of the dense matter that is created in heavy-ion collisions, fluctuates from event to event. In particular, the flow vectors at two different transverse momenta fluctuate with respect to each other. One way to probe this flow fluctuation is to study the decorrelation between the flow at two different momentum bins. However, the flow vector decorrelation
can occur as a combined effect of flow magnitude fluctuation and flow angle (flow direction) fluctuation. Thus, these flow fluctuations can be mapped using the flow factorization breaking coefficient. Moreover, the factorization breaking coefficient for second moments of flow vectors can be constructed. This additional observables allow to measure separately the flow magnitude and the flow angle decorrelation. Following the preliminary data from ALICE, we study the correlation between the harmonic flow squared, where one of the flow is fixed at a transverse momenta and the other is averaged over the momentum range (global flow). As a result of the factorization, the independent measurement of the flow vector correlation and flow magnitude correlation can lead to the possible extraction of flow angle correlation. Our model results are compared to the data. We also study the momentum dependent correlation between mixed flow harmonics and present possible predictions, which
could be used to gain additional information on the fluctuating initial state and the dynamics in heavy-ion collisions. (P. Bozek , R. Samanta, arXiv:2109.07781)

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