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Leading and sub-leading flows at the LHC from the CMS

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The initial state fluctuations of the colliding heavy ion nuclei play a major role in understanding the anisotropic flow of final state particles. Furthermore, an important signature of these fluctuations is the flow (event-plane) angle dependence from p_T that induces a measurable effect of factorization breaking in a pure relativistic hydrodynamic picture. The effect can be quantified by a Pearson like correlation coefficient, using the standard two-particle method, showing significant deviation below unity for very central collisions. Here, the effect of factorization breaking is described using a new method based on principal component analysis (PCA) and two-particle correlations. The method exposes leading and subleading mode, the leading corresponding to the standard elliptic and triangular flow and the subleading representing a new variable that is a direct response to initial state fluctuations. In this study, first measurements of the subflow are presented, as a function of transverse momentum in PbPb collisions at 2.76 TeV and high-multiplicity pPb collisions at 5.02 TeV with CMS data.

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