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Multi-parton interactions in pp collisions using charged-particle flattenicity with ALICE

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Event classifiers based either on the charged-particle multiplicity or on event topologies, such as spherocity and Underlying Event, have been extensively used in proton-proton (pp) collisions by the ALICE Collaboration at the LHC. These event classifiers became very useful tools since the observation of fluid-like behavior in high multiplicity pp collisions, for example radial and anisotropic flow. Furthermore, the study as a function of the charged-particle multiplicity in the forward V0 ALICE detector allowed for the discovery of strangeness enhancement in high-multiplicity pp collisions. However, one drawback of the multiplicity-based event classifiers is that, requiring a high charged-particle multiplicity, biases the sample towards hard processes like multijet final states. These biases blur the effects of multi-parton (MPI) interactions and make it difficult to pin down the origins of fluid-like effects.

This contribution explores the use of a new event classifier, the charged-particle flattenicity, defined in ALICE using the charged-particle multiplicity estimated in $2.8 < \eta < 5.1$ and $-3.7 < \eta < -1.7$ intervals. New final results on the production of pions, kaons, protons, and unidentified charged particles at midrapidity ($|\eta| < 0.8$) as a function of flattenicity in pp collisions at $\sqrt{s} = 13$ TeV will be discussed. It will be shown how flattenicity can be used to select events more sensitive to MPI and less sensitive to final state hard processes. All the results are compared with predictions from QCD-inspired Monte Carlo event generators such as PYTHIA and EPOS. Finally, a preliminary study using the flattenicity estimator using Run 3 data will be shown.

Category

Experiment

Collaboration (if applicable)

ALICE

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