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ALICE explores the dependence of strangeness production on global and local properties of the pp collision

The ALICE Collaboration observed that the production of light-flavoured hadrons relative to pions increases with the charged-particle multiplicity evolving smoothly across interaction systems and energies, from pp collisions to nucleus-nucleus collisions. Notably, this observation extends to the strange hadron sector, where an enhanced production in heavy-ion collisions with respect to minimum bias pp collisions is expected in the case of Quark-Gluon Plasma formation. Concurrent models attempt to explain such an increase. Some invoke the thermalisation of the system with a gradual release of the local conservation of the quantum charges; others describe the microscopic mechanism of hadronisation. In both cases, models are asking experiments to disentangle the effect of local and global properties of the system with more differential measurements. This contribution presents new results on the production of light-flavour hadrons using the pp data samples collected by ALICE during LHC Run 2 and Run 3. Strange particle production is correlated to global properties of the event exploiting the concept of effective available energy, estimated through the anti-correlated energy deposited in the ALICE Zero Degree Calorimeters. The production of (multi-)strange hadrons is further correlated to local properties of the collision, exploring the association with the production inside of jets and in the underlying event as a function of the charged-particle multiplicity. This can be done using event shape observables such as spherocity or exploiting a full jet reconstruction. Both cases will be discussed in this contribution, presenting new results. Additionally, the production of strange hadrons is further studied by exploiting a new event classifier based on the charged particle flattenicity, which proves to be more sensitive to multiple parton interactions (MPI) while being less sensitive to final-state hard processes compared to traditional event shape methods. All the results are discussed in light of predictions from QCD-inspired Monte Carlo event generators.

Category

Experiment

Collaboration (if applicable)

ALICE

Authors: COLLABORATION, ALICE; JACAZIO, Nicolò (Universita e INFN, Bologna (IT))

Presenter: JACAZIO, Nicolò (Universita e INFN, Bologna (IT))

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