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A model study for the understanding of particle production through jet-hadron correlation in pp collisions at 13 TeV

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At large hadron collider energies, a remarkable similarity has been observed in particle production mechanisms between large and small collision systems. In particular, the enhancement in baryon-over-meson ratios at intermediate transverse momentum and/or relative enhancement in production of particles with higher strangeness content at large multiplicities indicates that it may be possible that a partonic medium is also produced in the collisions of small systems. To classify broadly, particles are either produced via some non-perturbative QCD processes that involve quark-hadron duality or from hard QCD processes like jet-fragmentation which are theoretically better constrained. To understand the anomalous particle production in small systems it is important to separate the particles produced in hard processes (jets) from those produced in the soft underlying events. This would provide a better understanding of the similarities and differences in the particles production mechanism from small to large collision systems.
In this work we use jet-hadron correlation technique to separate particles which are produced in association with a hard process or jet from the underlying events in MPI-enabled PYTHIA8. This model has reasonable success in describing some features of the data in small systems which are generally linked with the medium formation. We calculate baryon-over-meson ratios of the particles in jets and in underlying events in minimum bias as well as high multiplicity events to understand whether the enhancement of baryon-over-meson ratios are linked with any modification of jet-fragmentations particularly in high multiplicity events or it comes from underlying events. We also compare our calculations with inclusive results and the available data.

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