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Exotic states production in nuclear collisions at the LHC energy

The production of exotic hadrons, such as $\mathrm{X}(3872)$, in pp collisions at $\sqrt{s} = 2.76\,\mathrm{TeV}$ is investigated by the parton and hadron cascade model {\footnotesize PACIAE}. In the simulation the final partonic state (Quark Matter, QM) and the final hadronic state (Hadron Mater, HM) are continuously processed and recorded. The $\mathrm{X}(3872)$ compact tetraquark state and loose molecular state are, respectively, coalesced and recombined in the QM and HM with the quantum statistical mechanics inspired dynamically constrained phase-space coalescence model. The formation time, velocity and temperature of QM (tetraquark state) and HM (molecular state) are proposed for the first time as identifying criteria between the two states. Our results in transverse momentum spectrum and rapidity distribution, etc. show a significant discrepancy between the two states and confirm that they are also valuable criteria identifying the $\mathrm{X}(3872)$ compact tetraquark state or molecular state.

Recently, this approach has been exteded to other exotic states, like glueball-like particle $\mathrm{X}(2370)$, T_{cc}, Sexaquarks, etc.

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