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Generalized Relativistic String Model for hadronization description

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One of the non-trivial problems in high energy hadronic interactions is the treatment of the process of the production of the final state hadrons from quarks, antiquarks and gluons of the parton shower. Many models of hadronization were developed and tuned to electron-positron collider data. However, data from recent both collider and cosmic ray experiments in high energy physics show the deviation from model predictions in proton-proton and meson-nucleus collisions, that seems to be not connected with collective effects. This motivates the search for new mechanisms taking place during hadronization process.

String fragmentation models of hadronization proved to provide the best self-consistent description of hadronization. One of the two most widely used approaches is LUND fragmentation scheme, that is historically implemented in well-known PYTHIA Monte-Carlo generator. The other is based on the Area Law and was first developed for use in Caltech-II model. This approach uses the Nambu-Goto action to derive the equations of relativistic string dynamics. This approach has a potential for future modifications but in existing models it is used in greatly constrained form.

The Generalized Relativistic String Model (GRSM-SI) is proposed to implement the full potential of the mathematical apparatus developed for Nambu-Goto strings. In the Model, the initially-stretched relativistic strings are considered. The realistic initial conditions are used that define the unique gauge that was not previously used in models. The Model provides the framework to calculate all essential string properties including spin-orbital angular momentum. The new fragmentation mechanism is introduced that allows the arbitrary daughter strings to be considered. The all-in-all freedom of the Model opens the possibilities of implementation of new mechanisms of particle production.

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