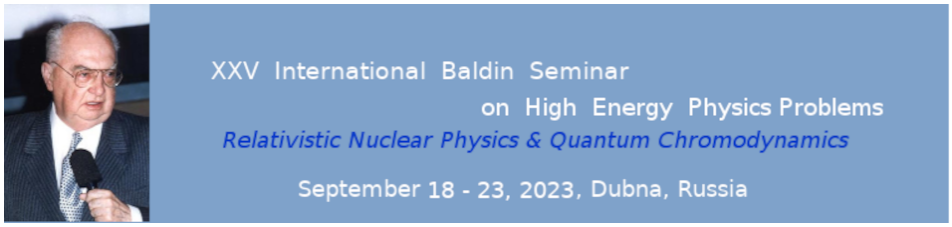


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# Tuning of Geant4 FTF model using NA61/SHINE experimental data

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The Geant4 FTF model is one of two hadronic models applied in the Geant4 package [1] for simulations of particle's and nuclei interactions with matter. It is used in many practical applications. Thus, it is very important to tune the model parameters to reproduce known experimental data. In the last decade, a large amount of experimental data on proton-proton (pp), proton-nucleus (pA) and nucleus-nucleus (AA) interactions have been obtained by the NA61/SHINE Collaboration. As shown by the collaboration, most of Monte Carlo event generators, except the EPOS model, cannot describe the data. Some progress has been made in the Geant4 FTF model.

The FTF (FRITIOF) model assumes that di-quarks are essential components of baryons. Thus, we tune, first of all, a probability of meson production at di-quark fragmentations, and describe proton spectra in proton-proton interactions [2]. K- mesons are mainly produced at quark fragmentation in the interactions. The yield of the mesons is proportional to a probability of strange quark-antiquark pair's creation at quark-gluon string fragmentation (~ 12%). In order to reproduce the energy dependence of the yield [2], we introduce a dependence of the probability on a string mass, and tune its parameters. The K+ meson yield is determined both by the quark fragmentation and a process of meson emission by the di-quarks. The NA61/SHINE experimental data on the K+ meson production in pp-interactions cannot be fitted tuning parameters due to the data scattering. Thus, we turn to the NA61/SHINE data on Λ-hyperon and K0s meson production in pp-interactions at projectile beam momentum 158 GeV/c [3,4], and tune the parameters. In order to check the tune, we analyzed data on p+C interactions at 31 GeV/c [5]. They are described well changing the probability of strange quark-antiquark pair's creation a little bit. The analogous change is larger for nucleus-nucleus interactions than for pA interactions. As a result, we describe the NA61/SHINE data on AA-interactions well enough starting at beam momentum of 13 GeV/nucleon up to 150 GeV/nucleon [6,7]. The tuned Geant4 FTF model can be used to provide reference data for NICA experiments.

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6. NA61/SHINE Collaboration (A. Acharya et al.) Eur. Phys. J. C81 2021) 397 Ar + Sc
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