

TOWARDS UNDERSTANDING OF K_s^0 MESON PRODUCTION IN HADRONIC INTERACTIONS

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Recently, the NA61/SHINE collaboration has presented experimental data on K_s^0 meson productions in proton-proton interactions at projectile momenta (P_{lab}) of 31, 40 and 80 GeV/c [1]. Earlier, the collaboration obtained the analogous experimental data at $P_{lab}=158$ GeV/c [2]. As it was shown in [1,2], there are no Monte Carlo models that can well describe all the experimental data. Only at $P_{lab}=158$ GeV/c, the EPOS model reproduces reasonably well the experimental data.

The description of the experimental data of the NA61/SHINE collaboration by the Geant4 FTF model [3] will be given in our report. According to the FTF model, K^- mesons are mainly produced by the fragmentation of quarks and antiquarks. Productions of K^+ mesons are connected with the fragmentation of di-quarks. The K_s^0 meson yields are coupled with the fragmentation of either quarks/anti-quarks or di-quarks.

Earlier, we have described [4] experimental data on K^+ and K^- meson productions in the proton-proton interactions measured by the NA61/SHINE collaboration. In that study, the main problem that we have identified was the tuning of the fragmentation of di-quarks for K^+ mesons. The experimental data on K_s^0 meson production allowed us to check our tuning. Now, we have reached the best description of K_s^0 yields in the proton-proton collisions.

The mechanism of the K_s^0 meson production can be studied using two-particle transverse-momentum correlations proposed by us in [5]. The correlations between K_s^0 mesons and Λ hyperons, protons, $\bar{\pi}^-$, π^- mesons produced in proton-proton interactions at center-of-mass energy of NN collisions of 10 GeV have been calculated in the Geant4 FTF and Pythia 6.4 models. The strong P_T correlations between K_s^0 mesons and Λ -hyperons, K^+ mesons, protons have been found. The two-particle P_T correlations can be studied at NICA SPD experiment. The study of the two-particle correlations can help to clarify the mechanism of quark-gluon string fragmentation.

1. NA61/SHINE Collaboration (N. Abgrall et al.), arXiv: 2402.17025
2. NA61/SHINE Collaboration (A. Acharya et al.), Eur. Phys. J. C82 (2022) 1.
3. Geant4 Collaboration (J. Allison et al.) Nucl. Instrum. Meth. A835 (2016) 186.
4. A. Galoyan and V. Uzhinsky, XXV International Baldin Seminar on High Energy Physics Problem, Sept. 2023, Dubna, Russia
5. A.Galoyan, A.Ribon, V.Uzhinsky, MDPI Physics 5 (2023) 3, 823-831