Contribution ID: **1257** Type: **Oral**

Analysis of the rare kaon decay K->pipipig at the CERN-NA62 experiment

Tuesday 31 October 2023 17:20 (15 minutes)

The decay of the charged kaon K+⟶π+π-π+γ is currently rather poorly studied. A research (Shapkin et. al, 2019) confirmed the correspondence of the differential branching values with the calculated values based on the chiral perturbation theory, but only for photons with an energy of at least 30 MeV. Currently, the measured value of the branching of this decay is (1.04±0.31)*10^-4 under the condition Eγ* > 5 MeV. The experimental setup NA62, having superior technical characteristics, allows to obtain many times more decay events and to measure the decay parameters more accurately, as well as over a larger range of photon energies.
Within the framework of this work, a selection of events of the decay K+⟶π+π-π+γ was developed and carried out. Signal and background decays are modeled using the Monte Carlo method. The differential branching of the decay was measured depending on the photon energy with a step of 1 MeV. There is a good correspondence in the predictions.
As a result, 69068±19 decays of K+⟶π+π-π+γ were selected and the branching of the process was calculated. The number of events with high (more than 50 MeV) photon energy was too small for the correct calculation of differential branching. For this purpose, to improve the accuracy of the results, the method of data unfolding was applied using a large number of K+⟶π+π-π+γ decays generated in advance by the Monte Carlo method. The data obtained are consistent with the previously obtained value of the process branching, and also complement it with the differential dependence of the branching on the photon energy obtained for the first time in the energy range from 10 to 70 MeV.

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Session Classification: High Energy Physics

Track Classification: High Energy Physics