

Measurement of the rare K^+ to π^+ ν $\bar{\nu}$ decay

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The decay $K^+ \rightarrow \pi^+ \nu \bar{\nu}$, with a very precisely predicted branching ratio of less than 10^{-10} , is among the best processes to reveal indirect effects of new physics.

The NA62 experiment reports the branching ratio measurement $BR(K^+ \rightarrow \pi^+ \nu \bar{\nu}) = (10.6 \pm 4.0 - 3.4_{\text{stat}} \pm 0.9_{\text{syst}}) \times 10^{-11}$ at 68% CL, based on the observation of 20 signal candidates with an expected background of 7.0 events from the total data sample collected at the CERN SPS during 2016-2018. This provides evidence for the very rare $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ decay, observed with a significance of 3.4σ . The experiment achieves a single event sensitivity of $(0.839 \pm 0.054) \times 10^{-11}$, corresponding to 10.0 events assuming the Standard Model branching ratio of $(8.4 \pm 1.0) \times 10^{-11}$. This measurement is also used to set limits on $BR(K^+ \rightarrow \pi^+ X)$, where X is a scalar or pseudo-scalar particle. Details are given of the analysis of the 2018 data sample, which corresponds to about 80% of the total data sample.

Future NA62 plans and prospects are also reviewed.

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