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68 - K^+ to π^+ ν $\bar{\nu}$ - First result from the NA62 experiment

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The accurate measurement of the very rare $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ decay branching ratio will allow us to probe the flavour sector of the Standard Model (SM) up to unprecedented energy scales.

Thanks to the process particular structure, the branching fraction can be calculated very precisely within the SM. The current best prediction is $\mathcal{B}(K^+ \rightarrow \pi^+ \nu \bar{\nu}) = (8.4 \pm 1.0) \times 10^{-11}$, where most of the uncertainty is propagated from CKM matrix elements entering the computation.

The observation of any deviation from the theoretical value would signal the presence of physics beyond the Standard Model.

The CERN NA62 experiment aims reach a 10% relative uncertainty on the branching ratio by using a novel decay-in-flight technique. Sub-nanosecond timing resolution, hermetic photon vetoes, measurement of incoming K^+ and outgoing π^+ momentums, and redundant particle identification systems are key to achieve the required 10:1 signal to background ratio.

The first NA62 $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ results obtained with 2% of the data collected during the 2016-2018 period are presented. One signal candidate was found while the expected background is 0.152 event. This translates to the upper limit $\mathcal{B}(K^+ \rightarrow \pi^+ \nu \bar{\nu}) < 14 \times 10^{-10}$ at 95% CL.

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