

# Physics Beyond the Standard Model with NA62

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The NA62 experiment at CERN took data in 2016–2018 with the main goal of measuring the  $K^+ \rightarrow \pi^+ \nu \bar{\nu}$  decay. The NA62 dataset is also exploited to search for light feebly interacting particles produced in kaon decays. Searches for  $K^+ \rightarrow e^+ N$ ,  $K^+ \rightarrow \mu^+ N$  and  $K^+ \rightarrow \mu^+ \nu X$  decays, where N and X are massive invisible particles, are performed by NA62. The N particle is assumed to be a heavy neutral lepton, and the results are expressed as upper limits of  $O(10^{-8})$  of the neutrino mixing parameter  $|U_{\mu 4}|^2$ . The X particle is considered a scalar or vector hidden sector mediator decaying to an invisible final state. Upper limits of the decay branching fraction for X masses in the range 10–370 MeV/c<sup>2</sup> are reported. An improved upper limit of  $1.0 \times 10^{-6}$  is established at 90% CL on the  $K^+ \rightarrow \mu^+ \nu \nu \nu$  branching fraction.

Dedicated trigger lines were employed to collect di-lepton final states, which allowed establishing stringent upper limits on the rates lepton flavor and lepton number violating kaon decays. Upper limits on the rates of several  $K^+$  decays violating lepton flavour and lepton number conservation, obtained by analysing this dataset, are presented.

The NA62 experiment can be run as a “beam-dump experiment” by removing the Kaon production target and moving the upstream collimators into a “closed” position. More than  $10^{17}$  protons on target have been collected in this way during a week-long data-taking campaign in 2021. New results from analysis of this data, with a particular emphasis on Dark Photon and Axion-like particle Models, are reported.

## Collaboration

NA62

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