

## Results and prospects from the NA62 experiment at CERN

*Thursday, 19 October 2023 15:10 (20 minutes)*

An overview of the latest results from the NA62 experiment at CERN and future prospects will be presented. The NA62 experiment collected the world's largest dataset of charged kaon decays in 2016-2018, leading to the first measurement of the branching ratio of the ultra-rare  $K^+ \rightarrow \pi^+ \nu \bar{\nu}$  decay, based on 20 candidates. This provides evidence for the very rare  $K^+ \rightarrow \pi^+ \nu \bar{\nu}$  decay, observed with a significance of  $3.4\sigma$ . This measurement is also used to set limits on  $\text{BR}(K^+ \rightarrow \pi^+ X)$ , where X is a scalar or pseudo-scalar particle. The analysis of the full 2016-2018 data sample and future NA62 plans and prospects are reviewed.

Rare kaon decays are among the most sensitive probes of both heavy and light new physics beyond the Standard Model description thanks to high precision of the Standard Model predictions, availability of very large datasets, and the relatively simple decay topologies. The NA62 experiment at CERN is a multi-purpose high-intensity kaon decay experiment, and carries out a broad rare-decay and hidden-sector physics programme. Recent NA62 results on searches for violation of lepton flavour and lepton number in kaon decays, and searches for production of hidden-sector mediators in kaon decays, are presented. Future prospects of these searches are discussed. Searches for visible decays of exotic mediators from data taken in beam-dump mode with the NA62 experiment are also reported. 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 by the NA62 experiment. We report on new results from analysis of this data, with a particular emphasis on Dark Photon and Axion-like particle Models.

The future availability of high-intensity kaon beams at the CERN SPS North Area gives rise to unique possibilities for sensitive tests of the Standard Model in the kaon sector. An overview of the physics goals, detector requirements, and project status for the next generation of kaon physics experiments at CERN will be also presented.

### Parallel Session

Fundamental Symmetries / New Physics Searches

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**Session Classification:** Symmetries and New Physics