

The $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ decay and New Physics searches at NA62

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The NA62 experiment at CERN was designed to measure the branching ratio of the ultra-rare decay $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ with a decay-in-flight technique. The Standard Model prediction for this branching ratio is very precise and $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ is an ideal candidate to search for indirect new physics at high-mass scales. NA62 took its first physics run in 2016, reaching the SM sensitivity for the branching ratio. In 2017 and 2018 the experiment collected, respectively, ~ 10 and ~ 20 times more data than in 2016. The results of the $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ analysis with the 2016 and 2017 data sets are presented and future prospects are discussed. Moreover, the high-intensity setup, the flexibility of its trigger system and the hermetic coverage of the experiment make NA62 a useful tool for the direct search of very weakly coupled particles in the MeV-GeV range, such as heavy neutral leptons, dark photons and axion-like particles. The status of these searches will be reviewed, along with other BSM searches performed at NA62.

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