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Latest results and precision measurements from the NA62 experiment

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The NA62 experiment at CERN 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, and presented in 2021.

In this talk the NA62 experiment reports new results from analyses of $K^+ \rightarrow \pi^+ \mu^+ \mu^-$ and $K^+ \rightarrow \pi^+ \gamma \gamma$ decays, using a data sample recorded in 2017-2018. The $K^+ \rightarrow \pi^+ \mu^+ \mu^-$ sample comprises about 27k signal events with negligible background contamination, and the presented analysis results include the most precise determination of the branching ratio and the form factor. The $K^+ \rightarrow \pi^+ \gamma \gamma$ sample contains about 4k signal events with 10% background contamination, and the analysis improves the precision of the branching ratio measurement by a factor of 3 with respect to the previous measurements.

The NA62 experiment can also 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.

Primary author: BRIZIOLI, Francesco (CERN)

Presenter: BRIZIOLI, Francesco (CERN)

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