

# Phenomenology 2021 Symposium



Contribution ID: 1236

Type: Axions & ALPs

## Search for feebly interacting particles with NA62

Monday, 24 May 2021 16:30 (15 minutes)

The high-intensity setup and detector performance make the NA62 experiment at CERN particularly suited for searching new physics effects from different scenarios involving feebly interacting particles in the MeVGeV mass range.

A search for the  $K^+ \rightarrow \pi^+ X$  decay, where  $X$  is a long-lived feebly interacting particle, is performed through an interpretation of the  $K^+ \rightarrow \pi^+ \nu \bar{\nu}$  analysis of data collected in 2017-2018. Model-dependent upper limits are obtained assuming  $X$  to be an axion-like particle with dominant fermion couplings or a dark scalar mixing with the Standard Model Higgs. Upper limits set on the branching ratio  $BR(K^+ \rightarrow \pi^+ X)$  improve on current limits for  $m_X$  below 260 MeV/c<sup>2</sup> and rest lifetimes above 100 ps.

A search for  $K^+ \rightarrow \mu^+ \nu X$ , where  $X$  is a massive invisible particle, is performed using the 2016-2018 data set. 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 for the first time, ranging from  $O(10^{-5})$  to  $O(10^{-7})$ .

A study of a sample of  $4 \times 10^9$  tagged  $\pi^0$  mesons from  $K^+ \rightarrow \pi^+ \pi^0 (\gamma)$  is performed, searching for the decay of the  $\pi^0$  to invisible particles. No signal is observed in excess of the expected background fluctuations. An upper limit of  $4.4 \times 10^{-9}$  is set on the branching ratio at 90% C.L. improving on previous results by a factor of 60.

### Summary

**Primary authors:** CENCI, Patrizia (INFN Perugia (IT)); VOLPE, Roberta (Comenius University)

**Presenter:** VOLPE, Roberta (Comenius University)

**Session Classification:** Axions & ALPs II