

A Rare Kaon Decay in a U(1) Dark Two Higgs Doublet Model

Content

We study the flavour-changing-neutral-current decay $K^+ \rightarrow \pi^+ Z_d$ with a dark Z_d in the context of a $U(1)_d$ dark two-Higgs-doublet model with a complex dark singlet. In this model, the second Higgs doublet is charged under $U(1)_d$, while Standard Model fermions are neutral. The dark gauge boson acquires mass through the spontaneous breaking of $U(1)_d$ and couples to the Standard Model via Z - Z_d mass mixing. The decay is induced at the loop-level by the flavour-changing transition $s \rightarrow dZ_d$. We compute the one-loop contributions from diagrams involving W^\pm bosons, charged Higgs bosons, charged Goldstone bosons, and up-type quarks in the loop. We present preliminary results for the branching ratio to provide an initial assessment of the parameter space allowed by current bounds from the NA62 experiment and from previous studies based on a longitudinal dark Z_d approximation.

Summary

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