Contribution ID: **40** Type: **Parallel Talk**

Dark Z in the Light of the Recent NA62 Results

Monday, 30 November 2026 15:30 (20 minutes)

Rare kaon decays constitute a sensitive probe in the search for new physics, since flavour-changing neutral-current interactions are absent at tree level in the Standard Model and are highly suppressed at the loop level. Processes such as $K^+ \to \pi^+ +$ invisible are particularly interesting in searches for light new particles that couple weakly to the Standard Model and can be produced through flavour-changing transitions. We study the decay $K^+ \to \pi^+ Z_d$ with a dark Z_d in the context of a $U(1)_d$ dark two-Higgs-doublet model with a complex scalar singlet. In this model, the second Higgs doublet and the scalar singlet are charged under $U(1)_d$, while Standard Model fermions are neutral. The dark gauge boson Z_d acquires mass through the spontaneous breaking of the electroweak and dark gauge symmetries and couples to the Standard Model through Z-Z_d mass mixing. The kaon decay is induced at the one-loop level by the flavour-changing transition $s \to d Z_d$. We compute the one-loop contributions from diagrams involving $W^\pm$ bosons, charged Higgs bosons, charged Goldstone bosons, and up-type quarks. We also study the consistency of the parameter space by imposing theoretical and experimental constraints on the scalar sector and confront the model with current bounds from low-energy observables and rare kaon decay measurements.

Academic position of the presenting author

MSc. Student

Primary authors: MOLINA ARIZA, Javier Enrique (Universidad Nacional Autónoma de México); Dr PEINADO RODRÍGUEZ, Eduardo (Instituto de Física - UNAM)

Presenter: MOLINA ARIZA, Javier Enrique (Universidad Nacional Autónoma de México)

Session Classification: Parallel Talks-SD:803

Track Classification: Flavor physics and CP violation