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Search for light Dark Sectors with the HIAF Muon Beam: HFRS-PKMu experiment proposal

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Sub-GeV light dark matter usually requires the existence of new light mediators, such as the dark Z boson in the $L_\mu - L_\tau$ gauge theory. Here we study the search potential for such a Z' boson based on a muon on-target experiment proposal, through $\mu e^- \to \mu e^- X$, with X decays invisibly. The experimental signature would be scattered muon and electron from the target, at large angles compared to backgrounds. Apart from these, activities will be low in the subdetectors located downstream from the interaction point. Here we focus on the usage of the 1-10 GeV muon beam from the HIAF-HFRS facility which is expected to start operation in 2025-2026. Compared with existing experiments or proposals using the CERN 160 GeV muon beam, we find high sensitivity on 10 MeV Z' range.

Muon dipole moments (magnetic and electric): theory, experiments and future perspectives

Charged lepton flavor violation: theory, experiment and future perspectives

New Physics opportunities with low and high energy muon beams

none

Neutrino physics with muon beams: theory, experiments and future perspectives

Muons beams technologies: production, cooling and acceleration at different energy

Advancements in Muon-based Facilities and Broader Applications

Muons in other fields: muography, muon spin spectroscopy, muon-catalyzed fusion

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