

Dark Pions at Neutrino Facilities

We present a chiral non-abelian dark sector model featuring a spontaneous $SU(3) \times SU(2) \rightarrow SU(3)$ symmetry breaking, resulting in the formation of dark mesons and baryons. The absence of a gauged $U(1)$ symmetry allows the dark baryons, typically the dark protons, to potentially serve as dark matter candidates. The model incorporates HNLs and explores scenarios with enhanced active-to-sterile neutrino mixing. We analyze the mixing between the dark meson π_D and the SM mesons π^0 and η . Utilizing this mixing and the known π^0 flux at neutrino facilities, we investigate the decay of π_D into pairs of HNLs. This study presents a novel approach where the ν_D emerges directly from the π^0 decay, providing distinct kinematic distributions compared to conventional neutrino mixing studies. Our investigation includes the DUNE and ICARUS near detectors, as well as stopped pion facilities and FASER ν . Additionally, we consider the atmospheric π^0 flux for ν_D production, offering intriguing possibilities for the DUNE far detector.

Authors: Dr ABDULLAHI, Asli (Fermilab); Dr TABRIZI, Zahra (Northwestern University); Prof. DE GOUVÊA, André (Northwestern University); Prof. DUTTA, Bhaskar (Texas A&M University); Dr SHOEMAKER, Ian (Virginia Tech)

Presenter: Dr ABDULLAHI, Asli (Fermilab)