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First Constraints on Heavy QCD Axions with a Liquid Argon Time Projection Chamber using the ArgoNeuT Experiment

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ArgoNeuT was a 0.24-ton Liquid Argon Time Projection Chamber (LArTPC) neutrino detector at Fermilab running from 2009 to 2010. It was located along the NuMI neutrino beam upstream of the MINOS near detector and collected six months of data in anti-neutrino beam mode. ArgoNeuT's dataset has been used to perform numerous first neutrino cross-section measurements on argon. It can also be used to probe physics beyond the standard model resulting from high-energy proton fixed-target collisions in the NuMI beam. ArgoNeuT has recently performed the first search for heavy QCD axions in a LArTPC neutrino detector. These could be produced in the NuMI beam target and absorber as a result of meson-mixing and then decay with a dimuon signature that can be identified using the unique capabilities of ArgoNeuT and the MINOS near detector. This decay channel is motivated by a broad class of heavy QCD axion models that address the strong CP and axion quality problems with axion masses above the dimuon threshold. This talk will present the results of this search and the new constraints that can be applied on the heavy QCD axion parameter space.

Submitted on behalf of a Collaboration?

Yes

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