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Improved Limits on Millicharged Particles Using the ArgoNeuT Experiment at Fermilab

A search for millicharged particles, a simple extension of the standard model, has been performed with the ArgoNeuT detector exposed to the Neutrinos at the Main Injector beam at Fermilab. The ArgoNeuT Liquid Argon Time Projection Chamber detector enables a search for millicharged particles through the detection of visible electron recoils. We search for an event signature with two soft hits (MeV-scale energy depositions) aligned with the upstream target. For an exposure of the detector of 1.0×10^{20} protons on target, one candidate event has been observed, compatible with the expected background. This search is sensitive to millicharged particles with charges between $10^{-3}e$ and $10^{-1}e$ and with masses in the range from 0.1 GeV to 3 GeV. This measurement provides leading constraints on millicharged particles in this large unexplored parameter space region.

Mini-abstract

Searching for millicharged particles in ArgoNeuT

Experiment/Collaboration

ArgoNeuT

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