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Searching for rare processes in short-baseline neutrino experiments with liquid argon time projection chambers

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A number of anomalies have been observed in accelerator-based short-baseline neutrino experiments since the 1990s, including the LSND anomaly and MiniBooNE low energy excess (LEE), motivating follow-up searches for exotic new physics Beyond the Standard Model (BSM). At the same time, the liquid argon time projection chamber (LArTPC) technology offers unprecedented spatial and calorimetric resolution for neutrino scattering in the 100 MeV to a few GeV energy range, and thus is a great platform for precise and sensitive searches for new physics in accelerator-based neutrino beams. MicroBooNE is an 85-tonne active mass LArTPC detector, which finished its neutrino run in 2020, and whose primary physics goal has been the investigation of the MiniBooNE LEE. MicroBooNE released its first results in October 2021, including results from a search for anomalously large single-photon production through neutrino-nucleus neutral current Delta resonance production, followed by Delta radiative decay. Follow-up analyses in MicroBooNE include searches for even rarer single-photon processes such as neutrino-nucleus coherent single-photon production, or BSM processes due to dark sector models predicting neutrino up-scattering and decaying into electron-positron pairs. Such processes can also be searched for with the upcoming Short-Baseline Near Detector (SBND) — a 112-tonne active mass LArTPC located in the same neutrino beamline as MicroBooNE, which will run as part of the Fermilab SBN program beginning in 2023. This poster will review opportunities for precise and sensitive searches for rare and new physics processes with MicroBooNE and SBN.

In-person or Virtual?

In-person

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