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MicroBooNE and the Road to Large Liquid Argon Neutrino Detectors

Liquid Argon Time Projection Chambers (LArTPC's) provide a promising technology for multi-kiloton scale detectors aiming to address–among other pressing particle physics questions–short and long baseline electron (anti)neutrino appearance. MicroBooNE, a 170 ton LArTPC under construction, is the next necessary step in a phased R&D effort toward construction and stable operation of larger-scale LArTPC's. This development effort also leans heavily on the ArgoNeuT and LAr1 LArTPC R&D experiments at Fermilab. In addition to advancing the LArTPC technology, these projects also provide unique physics opportunities. For example, MicroBooNE will be located in the Booster Neutrino Beamline at Fermilab, at ∼470 m from neutrino production. Thus, in
addition to measuring a suite of low energy neutrino cross sections on argon, MicroBooNE will investigate the anomalous low energy excess seen by the MiniBooNE experiment. Furthermore, the neutrino beam energy and relatively short baseline provide MicroBooNE with sensitivity to high-
$Deltam^2$ neutrino oscillations. This talk will present the MicroBooNE detector and its physics reach in detail, and explore the physics potential of a dedicated near-future neutrino oscillation program at the Booster Neutrino Beamline, which would
maximize the physics output of the Fermilab LArTPC R&D projects.

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