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Reconstruction and selection of charged-current electron neutrino interactions at ICARUS

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After successful operation at LNGS and a major upgrade at CERN, the 760-ton ICARUS T600 detector has been running at Fermilab since 2020, collecting neutrino interactions from the BNB and NuMI beams.

In late 2025, ICARUS reached five years of continuous data taking, demonstrating the maturity of large-scale LAr-TPC technology and its relevance for future experiments such as DUNE.

First physics results from ICARUS include a muon neutrino disappearance search in the BNB and cross-section measurements with the NuMI beam.

This contribution presents progress in the reconstruction and selection of charged-current electron neutrino interactions in the off-axis NuMI beam, where the ν_e component is significantly enhanced compared to BNB. Improvements to electromagnetic shower reconstruction have led to obtain a high-efficiency, high-purity sample of quasi-elastic-like charged-current electron neutrino interactions with good energy resolution, strongly rejecting photon-induced backgrounds from π^0 decays.

Applying this selection to NuMI data shows good agreement with the simulation and establishes a robust, well-understood ν_e sample, demonstrating the potential of ICARUS NuMI data for precision electron neutrino oscillation and cross-section measurements.

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