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Developing Wire-Cell techniques to improve a high efficiency high purity neutrino selection in the MicroBooNE LArTPC

The MicroBooNE Liquid Argon Time Projection Chamber promises high precision particle reconstruction and neutrino selection. However, as a surface detector, the abundance of cosmic rays creates a significant source of background. To preserve the high-quality selection promised by this technology, multiple novel reconstruction techniques have been developed to remove background sources. First, a flash-charge matching algorithm simultaneously matches numerous cosmic ray charge-clusters with their non-beam-coincident flashes. Additionally, a pair of light mismatch taggers identify incorrect flash-charge pairs based on the predicted vs measured flash as well as the cluster location relative to the detector boundary. Finally, stopped and throughgoing muon taggers remove muons that originate outside the detector based on their boundary intersections and directionality, as measured by their charge deposition profile. Together, these algorithms allow MicroBooNE to improve the neutrino selection purity from 0.005% to 86% while maintaining an efficiency of 86%.

Mini-abstract

New reconstruction tools allow MicroBooNE to achieve high efficiency and purity neutrino selection.

Experiment/Collaboration

MicroBooNE

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