

Reconstruction for Liquid Argon TPC Neutrino Detectors Using Parallel Architectures

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Neutrinos are particles that interact rarely, so identifying them requires large detectors which produce lots of data. Processing this data with the computing power available is becoming more challenging as the detectors increase in size to reach their physics goals. Liquid argon time projection chamber (TPC) neutrino experiments are planned to grow by 100 times in the next decade relative to currently operating experiments, and modernization of liquid argon TPC reconstruction code, including vectorization and multi-threading, will help to mitigate this challenge. The liquid argon TPC hit finding algorithm used across multiple experiments, through the LArSoft framework, has been vectorized and multi-threaded. This increases the speed of the algorithm up to 200 times within a standalone version on Intel architectures. This new version of the hit finder has been incorporated back into LArSoft so that it can be used by experiments. To fully take advantage of this implemented parallelism, an experiment workflow is being developed to run LArSoft at a high performance computing center. This will be used to produce samples as part of a central processing campaign.

Primary authors: BERKMAN, Sophie (Fermi National Accelerator Laboratory); CERATI, Giuseppe (Fermi National Accelerator Lab. (US)); GRAVELLE, Brian (University of Oregon); REINSVOLD HALL, Allison (Fermilab); PATERNO, Marc (Fermilab); PETERKA, Thomas (Argonne National Laboratory); NORRIS, Boyana (University of Oregon); WANG, Michael; YILDIZ, Orcun (Argonne National Laboratory)

Presenter: BERKMAN, Sophie (Fermi National Accelerator Laboratory)

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