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The LArIAT Experiment's Data Acquisition and Trigger System

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The LArIAT Liquid Argon Time Projection Chamber (TPC) in a Test Beam experiment explores the interaction of charged particles such as pions, kaons, electrons, muons and protons within the active liquid argon volume of the TPC detector. The LArIAT experiment started data collection at the Fermilab Test Beam Facility (FTBF) in April 2015 and continues to run in 2016. LArIAT provides important particle identification and cross section measurements for future liquid argon detector such as DUNE. The LArIAT detector consists of a 480 wire TPC, integrated PMT and SiPM light collection systems, downstream muon catcher blocks, four upstream multi-wire tracking chambers, time of flight scintillators, particle ID Cerenkov detectors and cosmic rag paddles. Each disparate detector element has independent timing, data acquisition and trigger systems with the significant challenge of integrating all of them into one seamless whole, operating reliably and flexibly within a tightly constrained budget, all while handling the unique test beam timing cycles. We will describe the integrated data acquisition solutions, the central and unusually flexibly trigger mechanism and the challenge of correlating event data across asynchronous subsystems, all of which must be nimble in the fast changing particle test beam world.

Tertiary Keyword (Optional)

Monitoring

Secondary Keyword (Optional)

Trigger

Primary Keyword (Mandatory)

DAQ

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