

Analyzing the Efficiency of the Trigger System in the ICARUS Neutrino Detector

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Neutrinos are elusive elementary particles with many interesting properties we would like to better understand. To do so, we use neutrino detectors like ICARUS. The detector employs a trigger system to filter the massive amounts of data collected daily, keeping only our desired events for further analysis. My work centers around analyzing the efficiency of the trigger system. The trigger works by setting a minimum requirement of light to cause an event to be recorded. I use a software emulation of the trigger hardware to analyze the efficiency of different light requirement levels in filtering out background from datasets of cathode-crossing particle tracks. We specifically used cathode-crossing tracks as those are the tracks for which we can reconstruct the track time, which is necessary for the trigger emulation. This data was collected without the hardware trigger system employed, creating a minimum bias dataset, without bias from the hardware trigger in filtering the data. I have analyzed the efficiency of the trigger system as a function of different track characteristics and uncovered the 2m track anomaly, which is that roughly 2m long tracks are less efficient at triggering.