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Performance of the Light Detection System in the ICARUS Detector at Fermilab.

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ICARUS is the largest Liquid Argon Time Projection Chamber (LArTPC) in operation and serves as the Far Detector of the Short Baseline Neutrino (SBN) program at Fermilab. It is exposed to both the booster neutrino beam (BNB) and the off-axis flux from the NuMI beam at Fermilab. The ICARUS detector is in two identical cryogenic modules of ~300 tons each. The ICARUS scintillation light detection system with 180 TPB-coated large-area Photo-Multiplier Tubes (PMTs) in each module, is crucial for triggering and event reconstruction. Due to its surface installation, the detector is exposed to a high flux of cosmic rays, necessitating precise timing to reject background events and align neutrino interactions with the accelerator beam time. This talk will provide details of the light detection system including its calibration for gain and time. The system has achieved superb stability and sub-nanosecond time resolution. The performance of the system in reconstructing the timing of neutrino interactions from the BNB and NuMI beams and rejection of cosmic rays by coincidence with a cosmic ray tagger will be discussed. Future work on neutrino reconstruction with the system independent of the TPC, and its use as a calorimetric tool for neutrino energy measurement will also be discussed.

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