

The upgraded laser calibration system of the ICARUS experiment at FNAL

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The ICARUS-T600 LAr TPC is presently used as far detector of the Short Baseline Neutrino (SBN) program at FNAL, to search for sterile neutrinos. As it is placed at shallow depth, in addition to a full coverage cosmic ray tagger, a system based on 360 large area Hamamatsu R5912-MOD PMTs was used, to reduce cosmic ray background. An important requirement is the calibration in gain and time of each PMT. Laser pulses from a low-power laser diode at 405 nm arrived to a 1x46 optical switch and then to UHV flanges, by 20 meters long optical patches. Light was then delivered to the ten PMTs connected to a single flange, by 7m long injection optical patches. As only ten PMTs may be calibrated in a single run, the full calibration procedure was lengthy. The use of an optical switch was compulsory as the power of the laser system was low. It was not clear if a further division of the laser light by a factor 1/36 (~1/100 taking into account also optical couplings) using instead an optical splitter could give a sizeable light signal to all PMTs. Dedicated on site measurements, with the initial laser calibration system, shown that it was feasible. Thus to reduce calibration time (by a factor 1/36) and have also the possibility to intercalibrate in time all PMTs, the optical switch was replaced by a custom 1x40 optical splitter. As respect to the original optical switch, the custom splitter had to provide similar delays (within 100 ps) and light outputs (within 10 %) at all output pigtails. Gain equalization of PMTs has reached a 1% resolution. In this procedure data from background photons were also used. Time calibration is in progress. The status of the upgraded laser system will be reported, together with present performances.

Collaboration

on behalf of the Icarus Collaboration

Role of Submitter

I am the presenter

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