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A particle detector system that exploits liquid argon scintillation light

This paper describes a particle detection system that exploits the prompt signals from the scintillation light produced by ionizing particles in liquid argon. The system includes 10 R5912 Hamamatsu photomultipliers (PMTs) coated with TPB for the detection of the VUV scintillation light. A laser calibration system is used to set the gains and determine the relative timing of the PMTs. The setup is installed in a double-wall, vacuum-insulated 1500 liters liquid argon cryostat. The cryostat is approximately 2 m high and has 105 cm external diameter, 96 cm internal diameter.
The PMTs DAQ system is realized with 500 MS/s digitizers read out by means of 1.25 Gb/s bandwidth optical links. The system allows the recording of the whole waveform of each PMT in order to associate the interaction time of each event occurring in the volume with high timing resolution. The digitizers also provide logic signals when the PMT signals exceed a defined threshold. The logic signals are processed by FPGA modules in order to generate the trigger.
The detector has been exposed to cosmic rays. The system performance in terms of trigger efficiency and timing resolution, with a view to its application in neutrino detectors, will be presented.

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