Contribution ID: **61** Type: **Poster**

Results from Testing of the Novel Optical Communication Scheme with the Clockless Q-Pix Charge Readout System in Gaseous Argon

Wednesday 8 October 2025 19:10 (20 minutes)

We present the results of testing the novel optical communication scheme for the Q-Pix charge readout in an Argon purity monitoring system. Q-Pix is a novel charge readout scheme which consists of a charge-integrate-replenishment circuit that provides replenishment pulses corresponding to the time when a particular amount of charge is collected. In our optical communication scheme, the replenishment data is transferred from the charge readout plane to the external environment optically instead of using a conventional data transfer. Here, the replenishment output of the Q-Pix is used to pulse an LED which is then read out using a SiPM spatially and electrically separated from the Q-Pix readout board. This is expected to reduce the noise injected from the environment into the charge readout plane and thus can achieve a better signal-to-noise ratio than wire-based communication. The purity monitoring system, in which this optical readout scheme is tested, has been built to determine the purity of Argon by measuring the transport efficiency of photoelectrons from the photocathode to the charge readout pixel on the anode. We first demonstrate the functionality of the optical readout scheme to effectively transfer the charge information from the anode. We aim to compare the signals collected using the optical readout scheme to those collected using the conventional readout.

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Session Classification: Poster

Track Classification: RDC 6 Gaseous Detectors