

Design of the Prototype Readout Electronic System of the Liquid Argon Detector for Direct Dark Matter Detection

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To meet the signal readout requirements of the ton-level prototype based on liquid argon (LAr) detector for the direct detection of dark matter, this report has designed a high-speed waveform digital readout electronics system based on the PXIe technology platform. The system uses multiple waveforms digitizing modules and a clock trigger module, which has good flexibility and scalability. For a single chassis, through the communication between the clock trigger module and the waveform acquisition module, the synchronization acquisition of 52 PMTs readout signals can be realized. For hundreds of PMT readout channels in the future, this design can achieve system expansion through the cascading of trigger modules in multiple chassis.

Summary

This report introduces the readout electronic system of the ton-level LAr detector used in direct dark matter detection experiments. The system realizes high-speed, high-precision, synchronous waveform acquisition and readout of PMT signals. It uses a digital trigger scheme, without the need for a traditional hardware trigger subsystem. Compared with commercial plug-ins, this customized readout electronic system provides a more flexible and scalable solution and has potential application value for the large-scale direct dark matter detection experiments of tens or hundreds of tons in the future

Primary author: Mr ZHAO, Keqing (ustc)

Presenter: Mr ZHAO, Keqing (ustc)

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