Contribution ID: **503** Type: **Oral**

High-speed and high-precision pulse digitization electronics system with high-bandwidth readout for frontier physics experiments

Tuesday 26 August 2025 17:40 (20 minutes)

Modern physics experiments are increasingly characterized by large-scale detection arrays and ever-higher requirements for data-acquisition precision, placing stringent demands on readout electronics. To address these challenges, we present a scalable, high-speed, high-precision waveform-digitization and high-bandwidth readout electronics system. Its multi-channel parallel analog front end supports programmable sampling rates from 125 MS/s to 10 GS/s and achieves intra-chassis channel synchronization better than 500 fs. Optical-fiber interconnection of multiple chassis enables seamless expansion to thousands of channels, while a dedicated 100 Gbps link between each chassis and the host server guarantees low-latency, lossless data transfer under high-throughput conditions. Real-time online processing on an FPGA–GPU heterogeneous platform further accelerates data handling. This robust architecture delivers the data-acquisition and processing performance required by cutting-edge dark-matter, neutrino, and other frontier physics experiments.

Collaboration you are representing

Authors: YANG, Haoyan (Tsinghua University); Prof. XUE, Tao (Tsinghua University); Mr LIANG, bo (Tsinghua University); Mr WEI, liangjun (Tsinghua University); Ms CUI, na (Tsinghua University); Mr CHEN, xiantao (Tsinghua University); Prof. LI, jianmin (Tsinghua University); Prof. LIU, yinong (Tsinghua University)

Presenter: YANG, Haoyan (Tsinghua University)

Session Classification: Underground Laboratories

Track Classification: Underground Laboratories – Technology