

## DAQ System Development for CEPC

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This report introduces the research and achievements made in developing the DAQ system aimed at CEPC. First, the work on the data flow framework RADAR will be presented. RADAR is a streaming readout framework developed in-house. Its early version has been operating stably in the LHAASO (Large High Altitude Air Shower Observatory) experiment, and the current version is set to be deployed for the JUNO (Jiangmen Underground Neutrino Observatory) experiment. The current upgrades and next development goals are aimed at CEPC, with the objective of providing a higher performance, more reliable, and flexible data acquisition framework. Additionally, exploration of heterogeneous acceleration methods is underway to leverage the unique features of different hardware platforms to enhance online data processing capabilities.

To better support the operation of the data flow software, online service software has also been developed. This software manages the data flow software and provides a rich set of system interfaces and services, enhancing the stability and reliability of the system. It also offers interfaces for DAQ users, presenting comprehensive system status through extensive information monitoring and intuitive visualization. Furthermore, a machine learning-based histogram anomaly diagnosis method has been introduced to reduce user burden and improve the accuracy and real-time detection of anomalies.

Finally, an LLM-based (Large Language Model) operational assistant is being developed with the objective of providing private information queries, automated operational monitoring and alerts, and intelligent anomaly analysis. The objective is to enhance the efficiency of the data acquisition system's operational information collection, extraction, and processing, thereby ensuring optimal and reliable functionality.

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