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# Data Acquisition system for real time operation of the CGEM Inner Tracker

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An innovative cylindrical gas-electron multiplier (CGEM) is under construction to replace the BESIII experiment inner drift chamber, which is suffering from aging. By the end of 2019 two of the three CGEM layers have been built and shipped to the Institute of High Energy Physics in Beijing. Due to SARS-CoV2 pandemic, the system has been remotely controlled since January 2020.

A special readout chain has been developed for data acquisition. Signals from the detector strips are processed by TIGER, a custom 64-channel ASIC that provides analog charge readout via a fully digital output. TIGER continuously transmits data over thresholds in triggerless mode, has linear charge readout up to about 50 fC, less than 3ns jitter, and power dissipation of less than 12 mW per channel. An FPGA-based off-detector module (GEMROC) was developed specifically to interface with TIGER. The module configures the ASICs and organizes the incoming data by assembling the event packets when the trigger arrives.

A full graphical user interface (GUFI) was developed in Python for testing, debugging and measuring the entire system. This interface provides all the functions needed to operate the electronics, including data acquisition and storage. Data, along with environmental and detector metrics, are continuously collected in a database and queried via a GRAFANA dashboard, to ensure operational reliability and verify data quality.

The entire system was designed with modularity, versatility, and scalability in mind. We present the data acquisition system of the CGEM detector, with special attention to online monitoring and fast analysis in realtime.

### Minioral

Yes

### IEEE Member

No

### Are you a student?

No

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