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Operation and readout of the CGEM Inner Tracker

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A recently approved ten-year extension of the BESIII experiment (IHEP, Beijing) motivated an upgrade program for both the accelerator and the detector. In particular, the current inner drift chamber is suffering from aging and the proposal is to replace it with a detector based on the cylindrical GEM technology.

The CGEM inner tracker consists of three coaxial layers of triple GEM. The tracker is expected to restore efficiency, improve z-determination and secondary vertex position reconstruction with a resolution of 130 μm in the xy-plane and better than 300 μm along the beam direction.

A dedicated readout system was developed. Signals from the detector strips are processed by TIGER, a custom 64-channel ASIC that provides an analog charge readout via a fully digital output up to about 50 fC, less than 3 ns jitter. TIGER continuously streams over-threshold data in trigger-less mode to an FPGA-based readout module, called GEM Read Out Card, that organizes the incoming data by building the event packets when the trigger arrives.

Two of the three layers are in operation in Beijing since January 2020 remotely controlled. Due to the pandemic situation the integration activity has been continued on a small-scale prototype. Recently, a test beam has been performed at CERN with the final electronics configuration.

In this presentation, the general status of the CGEM-IT project will be presented with a particular focus on the results from the test beam data acquisition.

Primary experiment

BESIII Italian Collaboration

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