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The new CGEM inner tracker and the custom TIGER ASIC for the BESIII experiment

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A new detector exploiting the technology of Cylindrical Gas Electron Multipliers (CGEM) has been proposed to replace the innermost tracker chamber of BESIII (Beijing Electron Spectrometer) experiment, which is suffering from aging due to the high luminosity of Beijing Electron Positron Collider (BEPCII).

The CGEM Inner Tracker will deploy several new features w.r.t. other state-of-art GEM detectors. The μ TPC and analog readout, using charge centroid method, will allow for a 130 μm spatial resolution in a 1 T magnetic field, keeping the number of channels to a manageable number (about ten thousand while the digital readout would require 25000 channels).

The channels are readout by TIGER (Torino Integrated GEM Electronics for Readout), a custom 64-channel mixed-mode ASIC, providing time and charge measurements with a fully-digital output. The charge measurement is obtained either from the time-over-threshold or the 10-bit digitization of the peak amplitude of the signal. The time of the event is measured by quad-buffered, low-power TDCs, based on analog interpolation techniques. For μ TPC readout, a time resolution of better than 5 ns is needed. A maximum event rate of 60 kHz (with a 4 \times safety factor) is foreseen per channel.

In this presentation, an overview of TIGER characterization will be covered with a particular focus on measurements to assess the functionality of the silicon and on first tests with the full-scale detector.

Experimental Collaboration

BESIII Italian Collaboration, BESIIICGEM Consortium

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