HK 50: Instrumentation XII

Time: Wednesday 17:30–19:00 Location: HBR 19: C 1

Group Report HK 50.1 Wed 17:30 HBR 19: C 1

The CBM First-level Event Selector — •Jan de Cuveland and Volker Lindenstruth — Frankfurt Institute for Advanced Studies, Goethe University Frankfurt am Main, Germany

The CBM experiment currently under construction at GSI/FAIR is designed to study QCD predictions at high baryon densities. The CBM First-level Event Selector (FLES) is the central event selection system of the experiment. Designed as a high-performance computer cluster, its task is an online analysis of the physics data including full event reconstruction at an incoming data rate exceeding 1 TByte/s.

The CBM detector systems are free-running and self-triggered, delivering time-stamped data streams. As there is no inherent event separation, timeslice building takes the place of global event building. The FLES combines the data from approximately 5000 input links to self-contained, overlapping processing intervals and distributes them to compute nodes. It employs a high-bandwidth InfiniBand network as well as dedicated custom FPGA input boards providing time-addressed access to buffered data. Subsequently, specialized algorithms analyze these processing intervals in 4-D, identify events, and select those relevant for storage. The developed hardware and software solutions are already being applied productively on a smaller scale in the mCBM experiment (FAIR Phase-0).

This presentation summarizes the status of the CBM First-level Event Selector project and includes results from recent mCBM campaigns. This work is supported by BMBF (05P21RFFC1).

HK 50.2 Wed 18:00 HBR 19: C 1

A FLES Interface Module for the CBM Common Readout Interface Card — •Dirk Hutter for the CBM-Collaboration — Frankfurt Institute for Advanced Studies, Goethe University, Frankfurt, Germany

The CBM First-level Event Selector (FLES) is the central data handling and event selection entity of the upcoming CBM experiment at FAIR. Constructed as a scaleable high-performance computing cluster, it is designed for online analysis of unfiltered physics data at rates exceeding 1 TByte/s.

Data from the detector systems enters the FLES via custom FPGA PCIe boards, the common readout interface. As part of the FPGA design, the FLES interface module (FLIM) implements the interface between subsystem-specific readout logic and the generic FLES data handling. It receives packaged detector messages and performs data transfers to the host's memory via a low-latency, high-throughput PCIe DMA engine. The custom design enables a true zero-copy data flow.

The first version of the FLIM is fully implemented and is in active use in CBM test setups as well as the FAIR Phase-0 experiment mCBM. The upcoming second generation of the FLIM optimizes the data flow and is designed to work with the next-generation interface card. An overview of the FLES input interface, performance studies, and plans for the next-generation FLIM will be presented.

This work is supported by BMBF (05P21RFFC1).

HK 50.3 Wed 18:15 HBR 19: C 1

Simple readout system of ALICE silicon detectors — •Bent Buttwill for the ALICE Germany-Collaboration — Physikalisches Institut Universität Heidelberg

The Outer Barrel Module (OBM) used in the the outermost four layers of ALICE Inner Tracking System (ITS2) utilizes interconnected Monolithic Active Pixel Sensors (MAPS) ALPIDE. The operational ITS2 has a surplus of spare modules available which could be used outside of the ALICE experiment. For this, a simpler readout was required to make use of the modules in tabletop experiments.

This talk introduces a readout system using the widely accessible microcontroller RP2040, with communication exclusively managed via the chip's slow control interfaces, enabling full configuration and data readout at reduced rates. A small scale proton-nucleus reaction cross section measurement proposed for 2024 at the Marburger Ionenstrahl-Therapiezentrum (MIT) will greatly profit from the large active area offered by the OBM and from the new readout system.

HK 50.4 Wed 18:30 HBR 19: C 1

The Data Acquisition for PANDA FAIR Phase-0 at MAMI — Luigi Capozza[1], Jonas Geisbüsch[1], Ravi Gowdru Manjunata[1], Samet Katilmis[1], Frank Maas[1,2,3], •Oliver Noll[1,2], David Rodriguez Piñeiro[1], Paul Schöner[1], Christoph Rosner[1], and Sahra Wolff[1] for the PANDA-Collaboration — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA Cluster of Excellence, Mainz, Germany

The PANDA FAIR Phase-0 experiment at the Mainz Microtron Facility (MAMI) is set to determine the double-virtual transition formfactor (TFF) of the pion. As a result, the uncertainty in the hadronic light-by-light (HLbL) calculation can be reduced. Consequently, the experiment will give new input to the hadronic corrections of the anomalous magnetic moment of the muon (g_μ-2 puzzle). The detector system for the experiment is a modified version of the PANDA backward calorimeter, which was designed by the electromagnetic process group (EMP) at HI-Mainz. In contrast to the PANDA experiment, the detector will operate in forward direction within a strong electromagnetic environment. The PANDA FAIR Phase-0 data acquisition is optimised to record the exclusive signal channel under high-background conditions. The talk addresses the readout chain with the analogue frontend, the digitisation using the PANDA SADC, the digital signal processing on FPGAs and the efficient data transmission via the Trigger Bus Synchronisation System (TRB).

HK 50.5 Wed 18:45 HBR 19: C 1

Data acquisition rate enhancement for experiments with exotic nuclei at GSI — •Martin Bajzek[1,2] and Nikolaus Kurz[1] for the Super-FRS Experiment-Collaboration — [1]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — [2]Justus-Liebig-Universitat Gießen, Gießen, Germany

In the search for ever more exotic nuclei, and probing into various physics phenomena at very low cross sections, one of the main limiting factors is the acquisition rate at which the detector systems can operate. Usually, the sampling rate is limited by the digital electronics' side, rather than analog detector hardware. We have integrated and adapted the MVLC Mesytec VME Controller into the standard GSI data acquisition system MBS (Multi Branch System), which is used for essentially all experiments on exotic nuclei at the fragment separator FRS. The expected goal is to enhance the acquisition rate capability by a factor 2...3. In this contribution, first results obtained with pulsed triggers and beams are discussed.