DAQ Status of COMPASS and AMBER Experiments

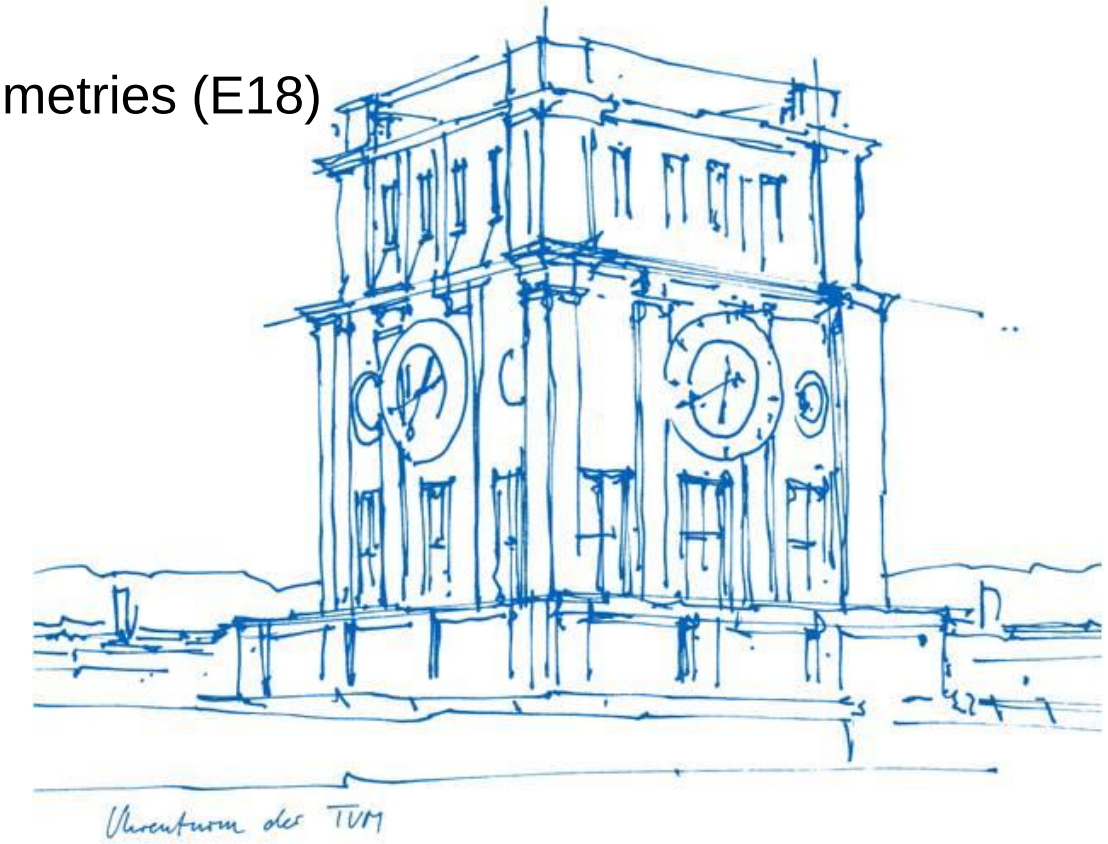
Igor Konorov on behalf of DAQ group

Institute for Hadronic Structure and Fundamental Symmetries (E18)

TUM Department of Physics

Technical University of Munich

TB Meeting, 20-th of September 2022



COMPASS DAQ Status

- **No hardware failure**
- **No long down time**
- **Stable operation**
- **Still some problems were observed**

Observed Problems

- **Memory overflow in PCCORE computers**
  - Reason : Occurred at high average data rate with short two spill and short super cycle.
  - Up to now only one CPU was used, the second CPU was activated
  - Increased overall performance by 20% and limited now by disk bandwidth
- **Loss of data in monitoring stream**
  - The increase of process performance caused loss of data in monitoring stream affecting MurphyTV and COOOL
  - It was resolved by introducing pauses after every monitoring event
- **Oscillation of Event Size in monitoring**
  - Occurred when Readout Engine does not complete processing of one spill data before start of next spill
  - Increasing performance of readout processes helped and additional adaptation of software to define last event in spill
- **Disk Full Error in PCCORE computers**
  - Timeout in copying data to CTA caused by network data congestion. CERN IT identified interference of COMPASS data flow with NA62. Change of data routing resolved the problem

Observed Problems

DAQ desynchronization incidents

- occurs when an event contains inconsistent spill number/event number/trigger type and not recovered by iFDAQ hardware logic
- It caused by Front End data format errors. We still have errors in MM or PGEM

Run number mismatch

- Run number is not incremented after starting new run. It occurs ones-twice a week
- Two runs with the same run number
- A discussion of the best way to resolve the problem is going on

New GUI sound alerts

- Sound alert triggered by errors on MW
- Fanfare between continuous runs
- End of run alert (fired when continuous running is disabled

AMBER DAQ

DAQ Setup

Reduced AMBER DAQ

Computing

- 2 x COMPASS type Read out Engines with new PCIe cards
- 1 x AMBER type Read out Engine with New Data storage
  - Second data storage was ordered
- File Server, DB Server
- 3 x HLT nodes
- High performance Juniper Ethernet switch
- 3 x RC computers in DAQ room

Hardware

- DHMux as Time Slice Builder
- DHMux as data generator
- DHMux as L0 MUX for iFTDC
- A7 TCS Conroller
- 10 x iFTDC cards connected to COMPASS Hodoscope and SciFi

Currents Status

- DAQ software (DB, Run Control, Readout processes) are ready more extensive tests with real detectors to be performed
- A7 TCS Controller is ready
- DHMx as TSB (Time Slice Builder) is ready
- DHMx as L0 data concentrator is in progress for iFTDC cards:
  - Handling of free running data format
  - Image merger
  - Aurora high speed serial link to TSB
- iFTDC
  - New firmware version clocked by TCS being tested now with COMPASS DAQ – the first data look good
  - Task for this week is to connect iFTDC to AMBER DAQ and start tests of different components
  - Integration of new iFTDC version in ConfigServer

Goal of 2022 Run

- Collect SciFi and Hodoscope data
- Perform measurements of data rate with nominal beam
- Collect data for coars and fine time calibration
- Test fine time calibration

Network Connection to TCL

- 3 years ago we submitted request to increase network bandwidth from 10 Gb to 20 Gb
- No progress up to now
- Meanwhile on MuonE request there are two 100 Gb links were installed (paid by MuonE)
- Two weeks ago we had a meeting (Stefano, Moritz, Igor) with CERN experts responsible for network
- Outcome :
  - Installation of new fibers required, more probably to be paid by AMBER. Cost estimate is 12k.
  - Alternative solution is to discuss with MuonE whether we can share existing fibers. In this case CERN will maintain this links and corresponding infrastructure
  - We may have to buy one more Juniper switch to root MuonE and AMBER network. It’s bout 1.5 kEuro
  - A meeting to discuss this point with MuonE to be scheduled in near future

Production of new Hardware

In production

- 8 x AMC Optical cards for DHMx modules for migration DAQ to ATCA shelf
  - Delay with delivery of components, expected to be delivered in end of 2022

In preparation for production

- 5 x A7 TCS controller modules for AMBER, Prague and spares
- 12 x DHMx for MWPC readout and standalone DAQ in Prague
- ~100 iFTDC cards for MWPC and SciFi detectors
- Expected delivery is end of 2023
- All interested groups please join the order. The order procedure will start start within few weeks

DAQ Related Issues

- Martin Zemko will be at CERN till end of 2022 then he will move to Prague and will be focused on his thesis. Prague is looking for new person but for a moment there is no candidate.

- Nobody will continue after Stefan Huber, so I'm alone for FPGA developments. Although I will have to spend significant time for other activities in 2023. I estimate my availability for AMBER in 2023 to be about 20%.

- My concern about detector readout systems :
  - No progress with integration of TPC read out in AMBER
  - No progress with GEM readout , still no report about VMM ASIC test last year
  - Slow progress with new MSADC read out development for ECAL

  - My suggestion is to work out a realistic schedules for these activities

THANK YOU