Online Monitoring System for BM@N and Raw Data Converter

Ilnur Gabdrakhmanov, Sergei Merts

VBLHEP, JINR

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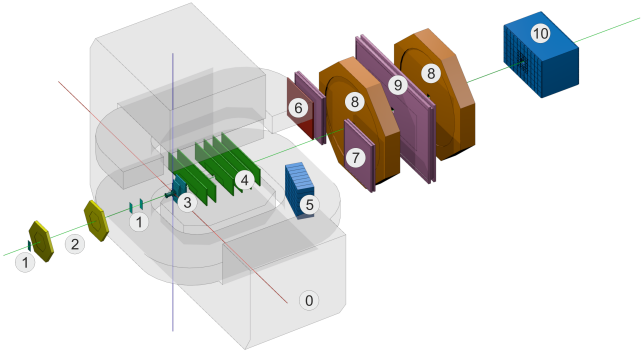
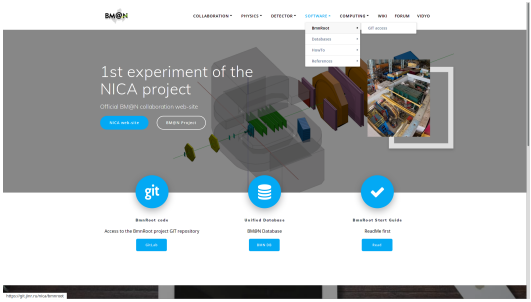
The BM@N Experiment



0 Analyzing magnet
1 Trigger detectors
2 MWPC (Multi-Wire Proportional Chamber)
3 ST (Silicon Tracker)
4 GEM (Gas Electron Multiplier)
5 ECAL (Electromagnetic Calorimeter)
6 CSC (Cathode Strip Chamber)
7 TOF1 (Time-Of-Flight detector)
8 DCH (Drift Chamber)
9 TOF2 (Time-Of-Flight detector)
10 ZDC (Zero-Degree Calorimeter)

https://bmn.jinr.ru

BM@N Framework BMNROOT

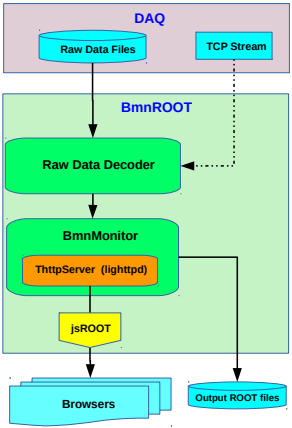


BmnROOT repository
https://git.jinr.ru/nica/bmnroot

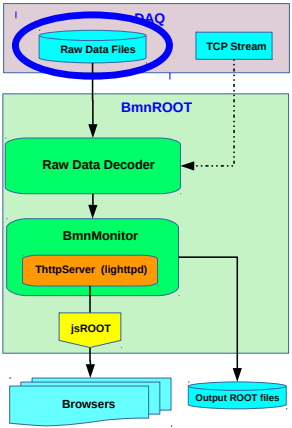
Benefits:

- Inherits basic properties from FairRoot (https://fairroot.gsi.de/) C++ classes
- Extended set of event generators for heavy-ion collisions
- Detector composition and geometry; particle propagation by GEANT3/4
- Advanced detector response functions, realistic tracking and PID included
- Event display for Monte-Carlo and experimental data

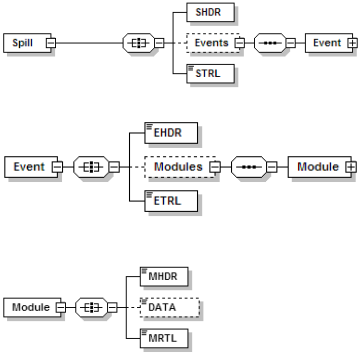
Monitoring workflow



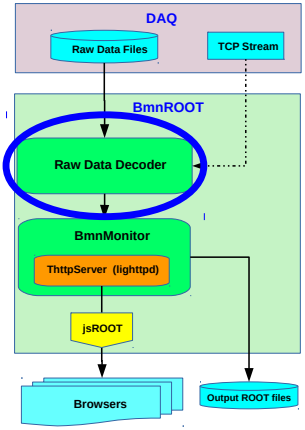
Monitoring workflow

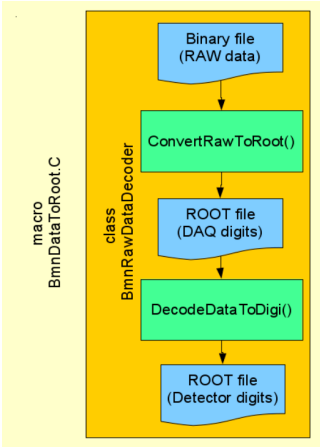


Raw Data Format

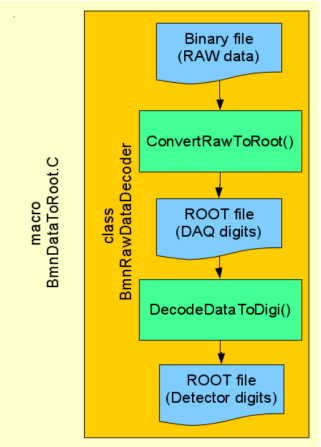


Decoding scheme





Decoding scheme



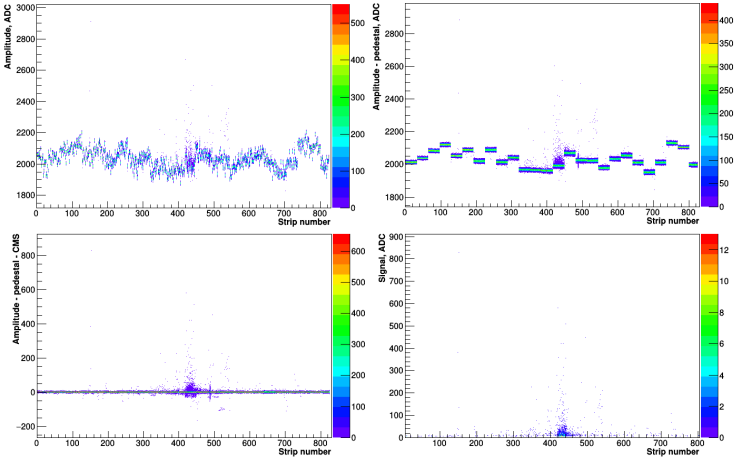
First step (Data Converter):

- Read a binary data file with RAW-data.
- Parse the data blocks: run/spill/event/module.
- Create «DAQ-digits» (ADC, TDC, TQDC, HRB, SYNC, etc.) accordingly DAQ-data-format and write them into a tree.

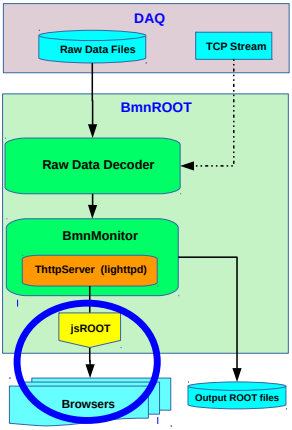
Second step (Data Decoder):

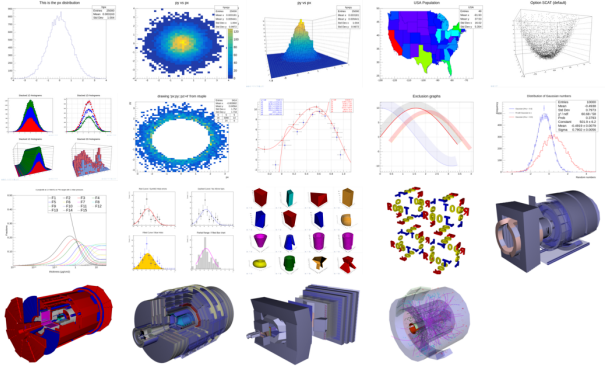
- Read detector mappings (channel-to-strip) from the Unified Database
- Calculate pedestals and common modes of channels
- Clear noisy channels
- Decode DAQ-digits into detector-digits (BmnGemDigit, BmnTofDigit, etc.)
- Write the tree with detector-digits to a ROOT-file

GEM ADC signal filtering



jsROOT

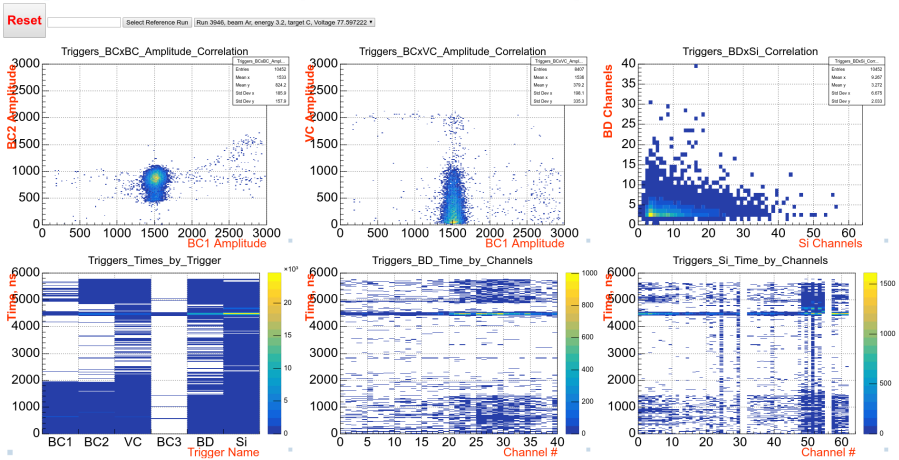




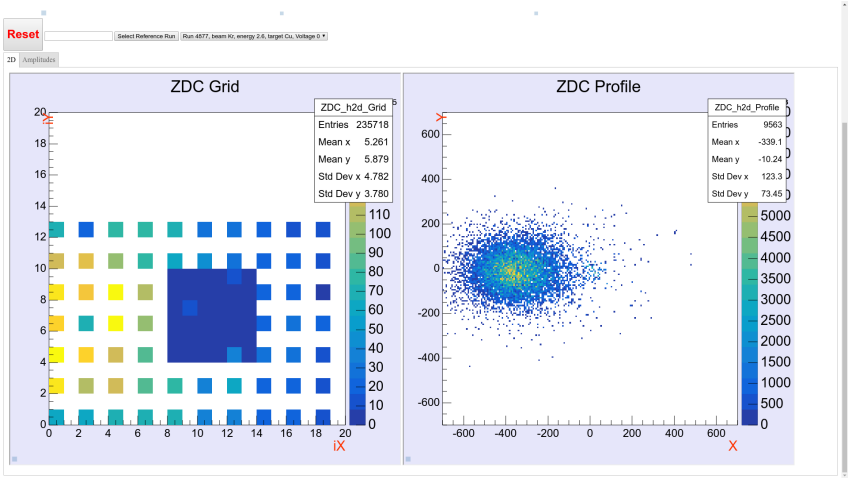
jsROOT website

https://root.cern.ch/js/

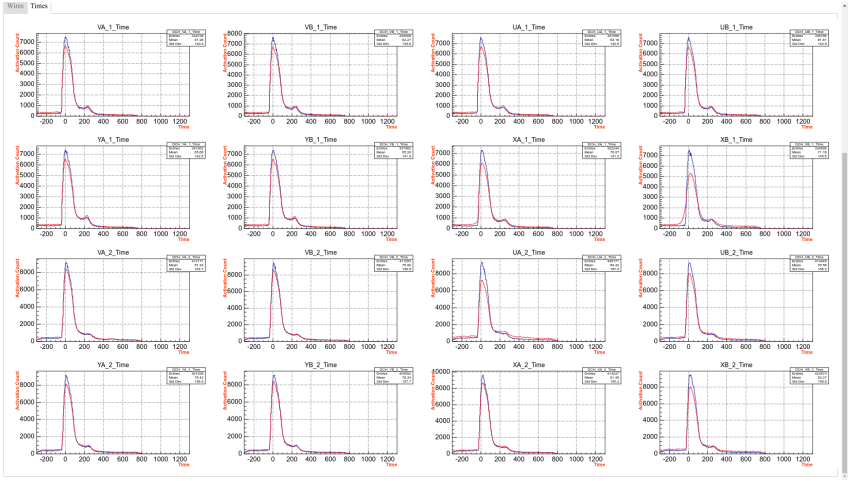
System overview. Trigger Counters



System overview. ZDC



System overview. Drift Chambers



Current status

Future Development Roadmap

- Parallelization of Raw Data Decoding
- Further QA Automation
- Embedding of The Full Event Reconstruction Chain and Tracks Visualization into Online.

Thank you for attention