# Data Offline Quality Analysis in the BM@N experiment

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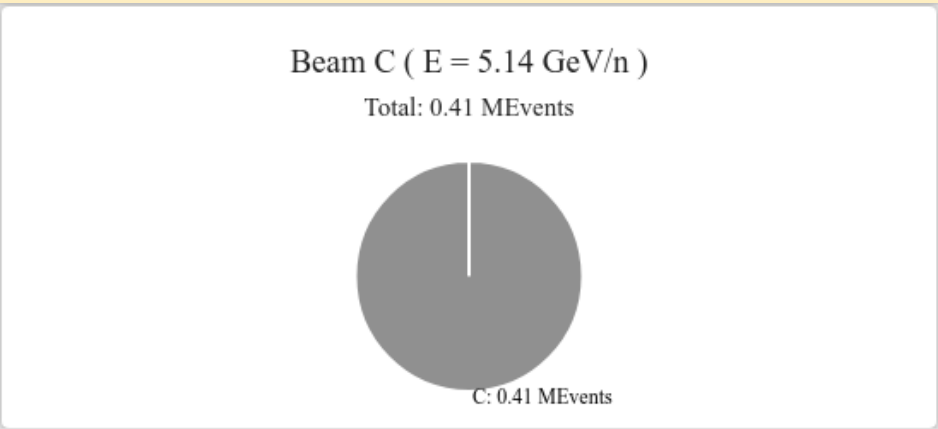
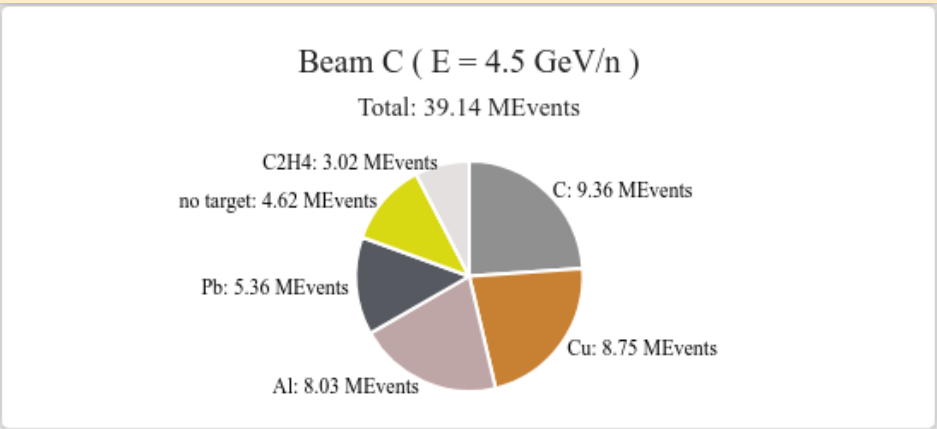
**Software & analysis meeting**

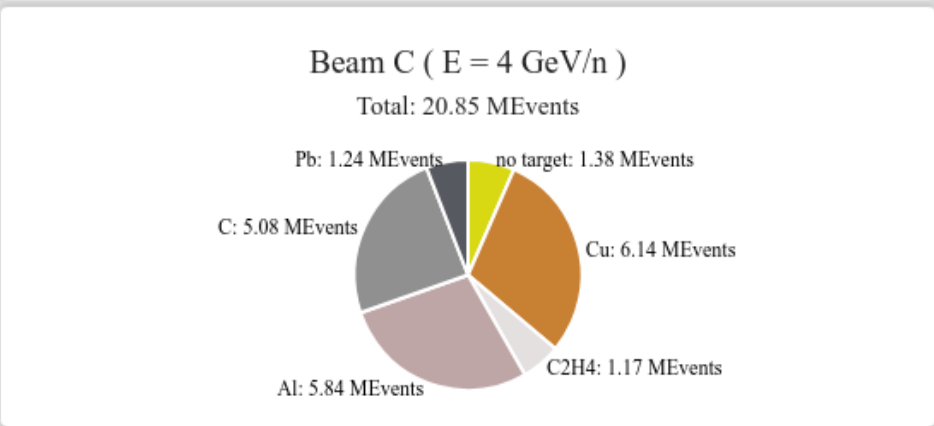
**October 14, 2019**

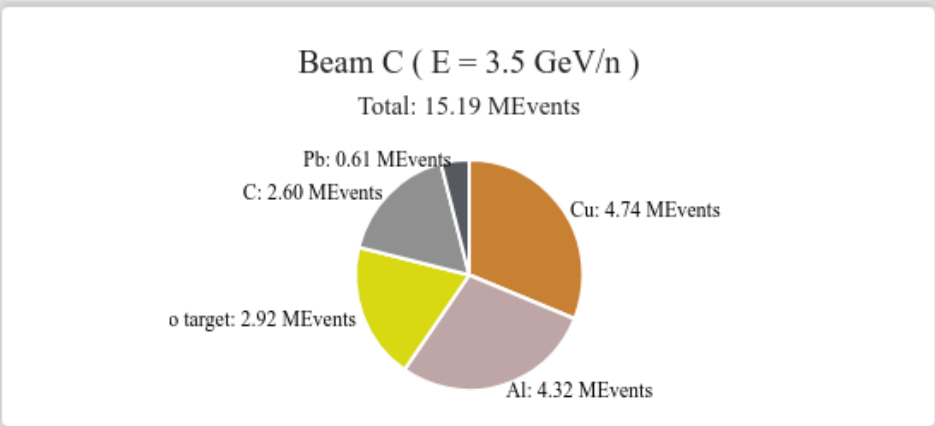
# BM@N RUN6: existing experimental data

## Carbon run



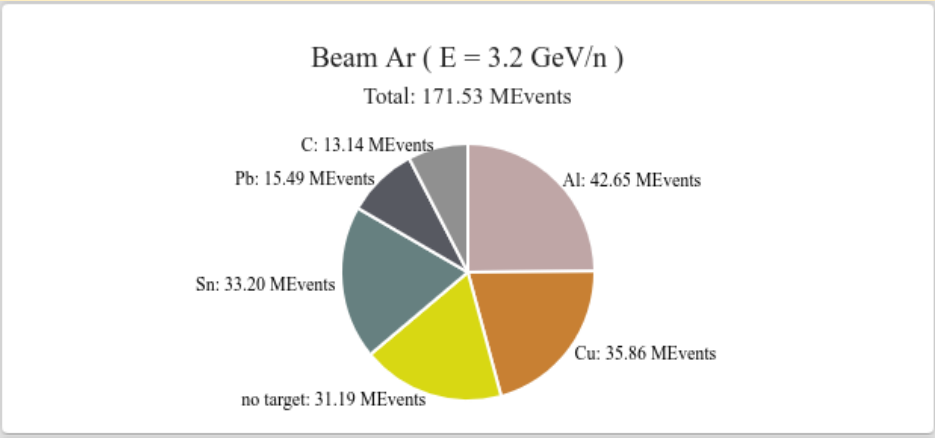



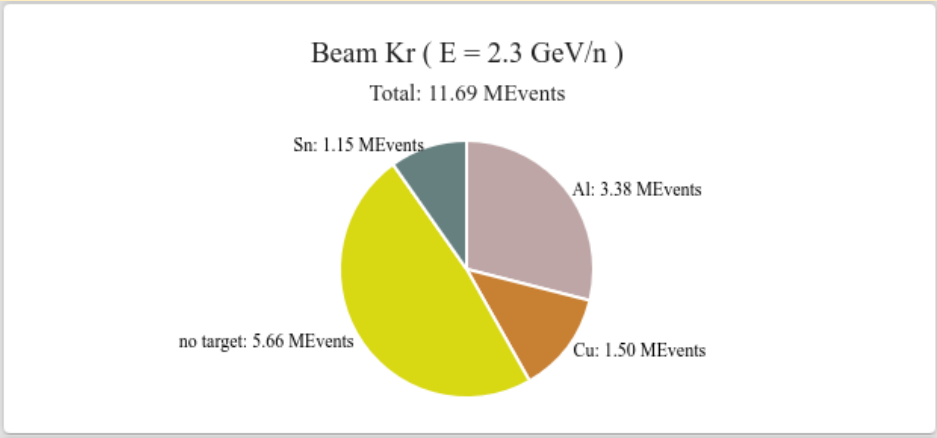



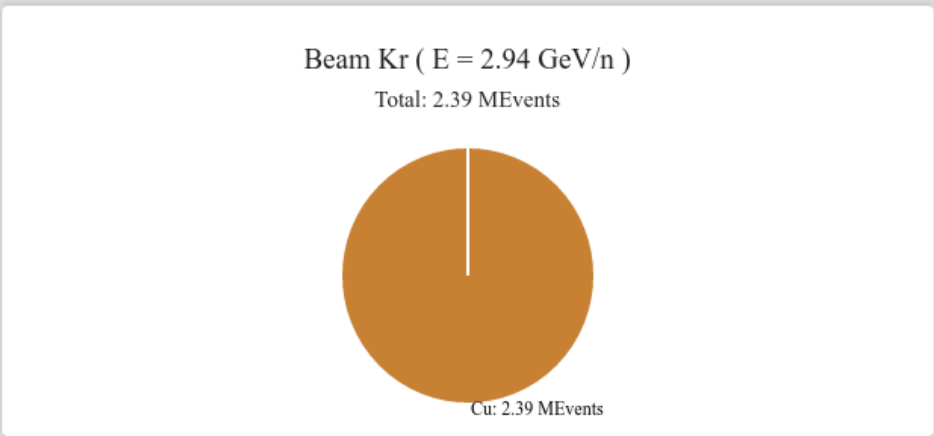

**Total amount is about of 75 MEvents**

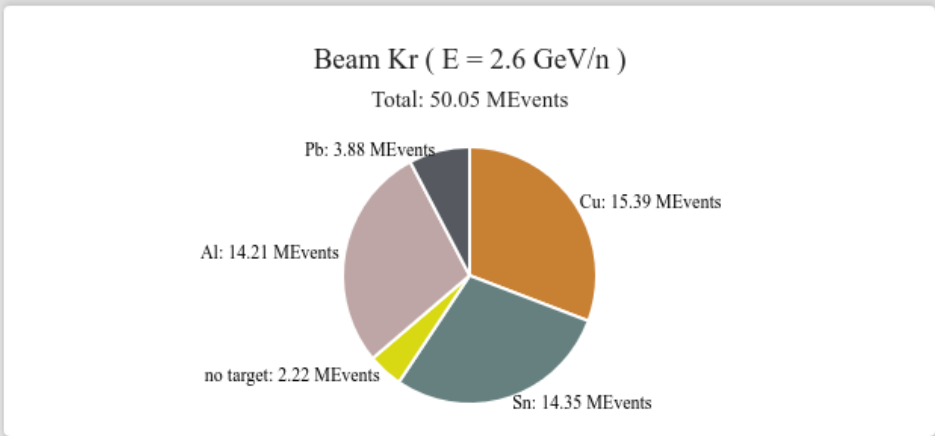
# BM@N RUN7: existing experimental data

## Argon and Krypton run




**Total amount is about of 237 MEvents**
**(increased by factor of 3 if comparing with RUN6)**

# Types of QA systems to be used

## Online:

- Shows mainly "raw" information got directly from a detector system when recording data to be sure of correct working regime of the detector
- Allows one to do a comparison between already recorded data
- Does not allow one to get a reliable information on high-level data analysis (hits, tracks, physics ...)

See report of I. Gabdrakhmanov to get more details on

## Offline:

- Has a module structure allowing one to work with different levels of data analysis
- Is much more flexible when adding information to be displayed
- Makes high-level data analysis more significant since one has some tested versions of alignment, hit producers and track finders...

# BM@N offline QA-system

## Why do we need to use it in BM@N?

- To see basic distributions got from existing experimental data for all detectors (trigger counters, GEM, SILICON, DCH ...) whether one relies on a run is being analized or not.
- To check hit finders and tracking by basic hit and track distributions (occupancy, reconstructed track parameters, results on matching and PID ...).
- Probably, to monitor something else that would require a precise monitoring:)

# BM@N offline QA-system

## What does it do right now?

- Different histograms are drawn for different detectors (meant those ones I called earlier as "basic distributions").
  - Triggers: Distributions of amplitudes, times, channels.
  - Coordinate detectors (GEM, SILICON, CSC): Distributions of fired strips per each station, module and layer.
  - Time detectors (TOF, MWPC, DCH): Distributions of amplitudes, planes, times and strips
  - Calorimeter detectors (ECAL, ZDC): Distributions of amplitudes and channels
- Basic hit and track distributions got from the tracking developed by our group (S. Merts et. al.).
- All mentioned above can be visualized either for a run we analize (current) or couple of them (current and reference)

# BM@N offline QA-system

## What does it use as an engine?

- HTTP server in ROOT (a class called THttpServer)
- Lighthttpd server on host to provide a WebUI for users

- WebUI displays histograms got from a file produced by offline histogram producer
- Class BmnQaOffline
- Class BmnQaMonitor

### offlineQA.C

```
void offlineQA(TString digiFile = "",
        TString dstBMN = "",
        TString dstCBM = "",
        TString out = "",
        Int_t nEvents) {

    bmnloadlibs(); // load libraries

    TStopwatch timer;
    timer.Start();
    FairRunAna* fRunAna = new FairRunAna();
    ...
    BmnQaOffline* qaSystem = new BmnQaOffline(dstBMN);
    fRunAna->AddTask(qaSystem);

    fRunAna->Init();
    fRunAna->Run(0, nEvents);
    ...
}
```

### startWebServer.C

```
void startWebServer() {
    BmnQaMonitor* mon = new BmnQaMonitor();
    mon->SetHistoDir("/nfs/RUN7_res/QA/output");
}
```

# BM@N offline QA-system

**Partially filled with data produced by the BmnRoot software release (19.10.0)**

## RUN6, BM@N

- No high-level data put (hits, tracks ...), just "raw" information from detectors
- Processed of about of 0.5 kFiles.

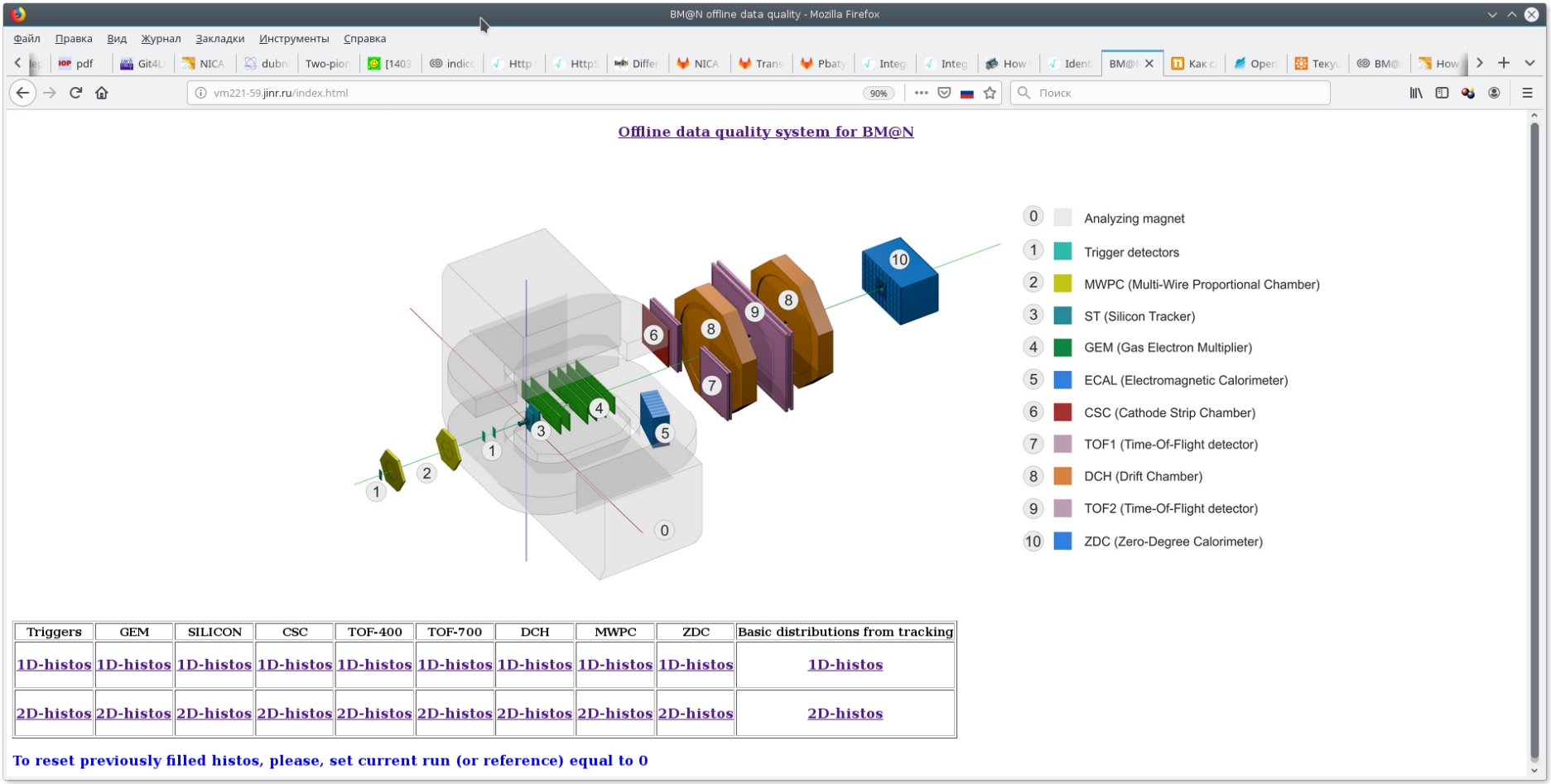
## RUN7, BM@N

- Processed of about of 0.6 kFiles, mainly corresponding to argon part of the run
- Shown high-level information is obtained with the current release of software

## RUN7, SRC

- Processed of about of 1 kFiles.
- Shown high-level information is obtained with the current release of software

# Structure of the BM@N offline QA-system



# BM@N offline QA-system

## Distributions of basic trigger parameters (amplitude, channels, time ...)

**Current Run: 1800**

**Energy: 4.50**

**Beam: C**

**Target: Cu**

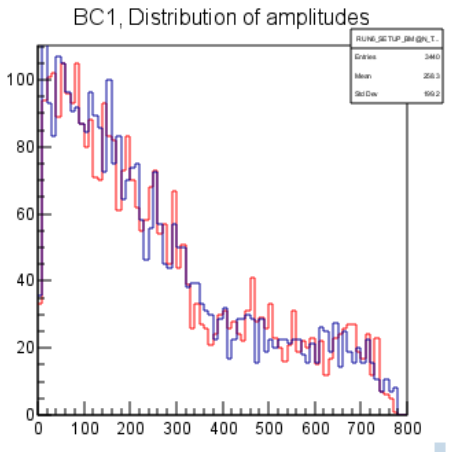
**Ref. Run: 1801**

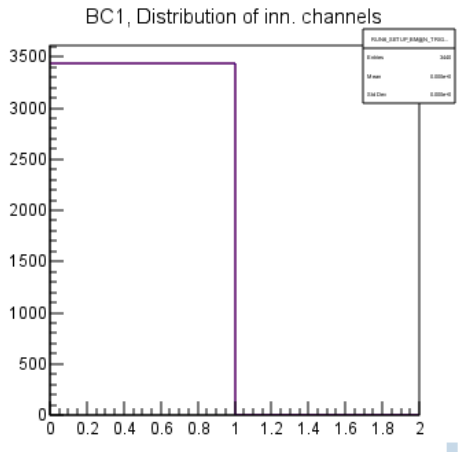
**Energy: 4.50**

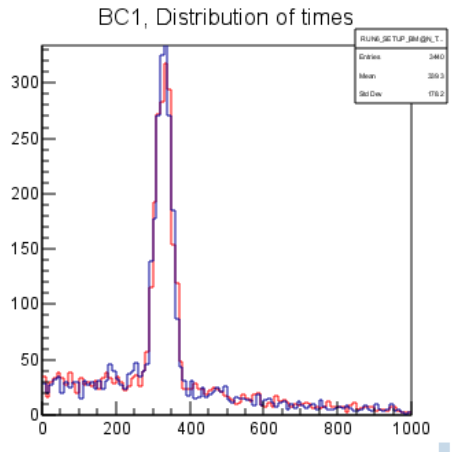
**Beam: C**

**Target: Cu**

| Select Release: | Select Period: | Select Setup: | Select Current Run: | Select Reference Run: |
|---|---|---|---|---|
| 0.0 | 6 | BM@N | Run 1800, beam C, energy 4.5, target Cu, Voltage 78 | Run 1801, beam C, energy 4.5, target Cu, Voltage 78 |



# BM@N offline QA-system

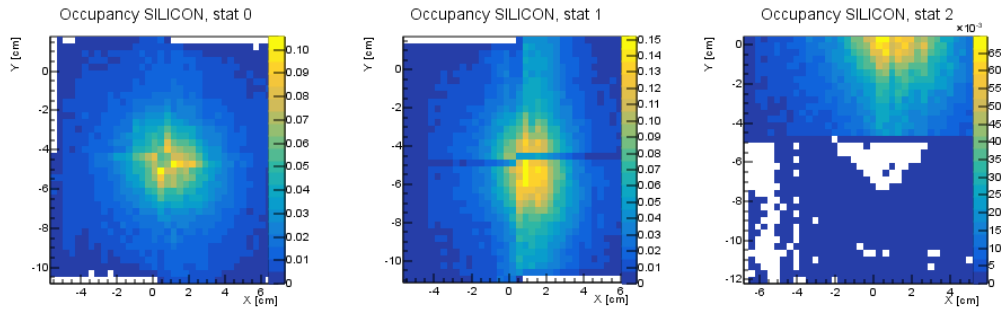
## Occupancy for SILICON in RUN7 SRC

**Current Run: 3387**
**Energy: 3.17**
**Beam: C**
**Target: H2**

**Ref. Run: 1801**
**Energy: 4.50**
**Beam: C**
**Target: Cu**

**Release: 0.0**
**Period: 7**
**Setup: SRC**

| Select Release: | Select Period: | Select Setup: | Select Current Run: | Select Reference Run: |
|---|---|---|---|---|
| 0.0 | 7 | SRC | Run 3387, beam C, energy 3.17, target H2, Voltage 108 | - |



# BM@N offline QA-system, conclusion

It is hosted on vm221-75.jinr.ru (LIT JINR, cloud infrastructure), probably, to be changed in future to bmn-qa.jinr.ru

## Already done:

- Extended to all possible configurations of BM@N existed
- Adopted clicking menu to choose release, period, setup ...
- Added an useful info canvas with meta-information on runs being analyzed

## To be done:

- Prepare a stable release of the system
- Add multi-user access
- Extend set of existing histograms and eliminate those ones not representative
- Establish correct binning and histogram ranges for some detectors
- Produce list of shown histograms with their brief explanations
- Improve visibility and usability of the system