

# MiraBelle status and plans for LS1

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# <https://mirabelle.belle2.org/> shows run dependency of any observable of interest

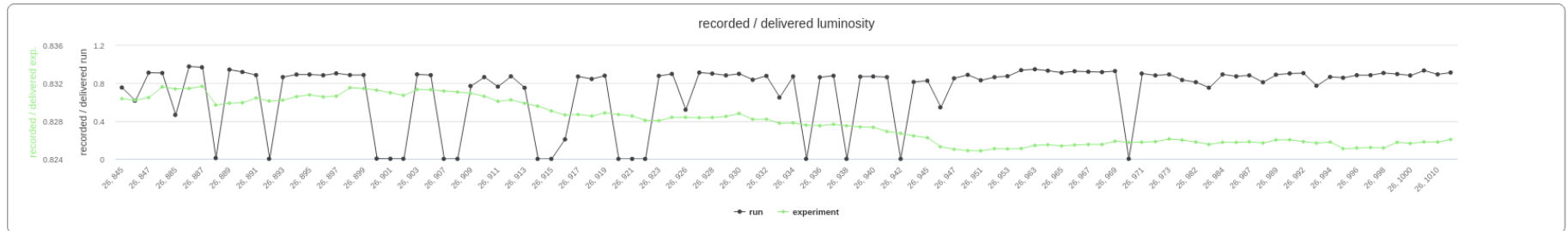
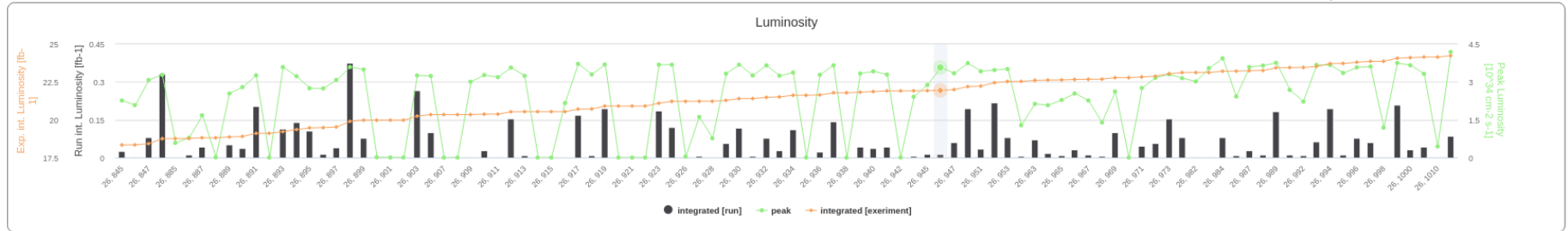
Run selection (press redraw if changed)

Start exp  Start run  End exp  End run  Additional criteria  redraw

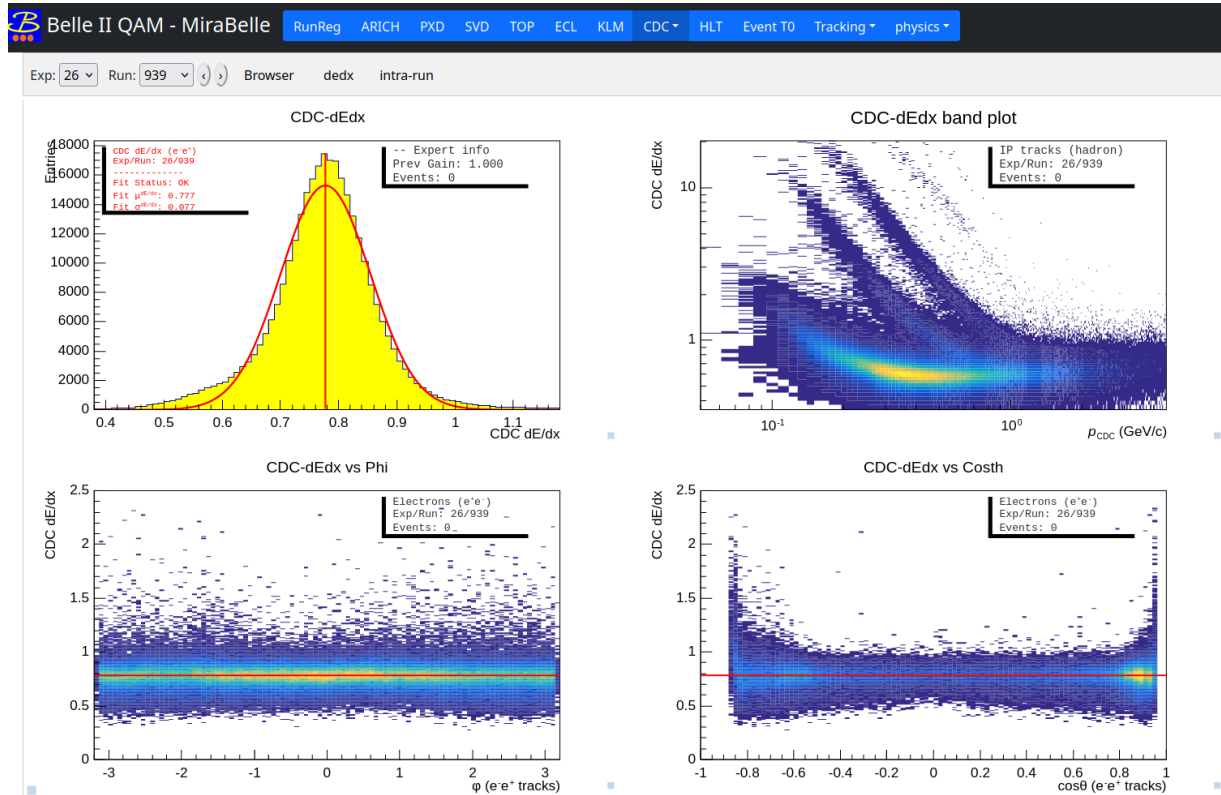
Source:  online  mc14rd  procl3

data quality beam conditions IP position

Shown period: 2022-05-30 04:16:27 - 2022-06-03 13:06:10



→ clicking on the run point can show histograms from a selected run



→ it is updated online, with few minutes of delay after end of each run

→ its purpose is monitoring of long term changes in detectors performance (sudden changes/problems should be observed by shifters in the online DQM!)

→ by now MiraBelle includes at least some data from all of detector sub-systems apart from the ECL

→ higher level observables are available from di-muon and D\* (PID) events



## LS1 plan

→ enrich data from TOP, KLM and ECL (detector experts)

→ add observables from additional physics modes, e.g.  $J/\psi$ ,  $K_s^0$

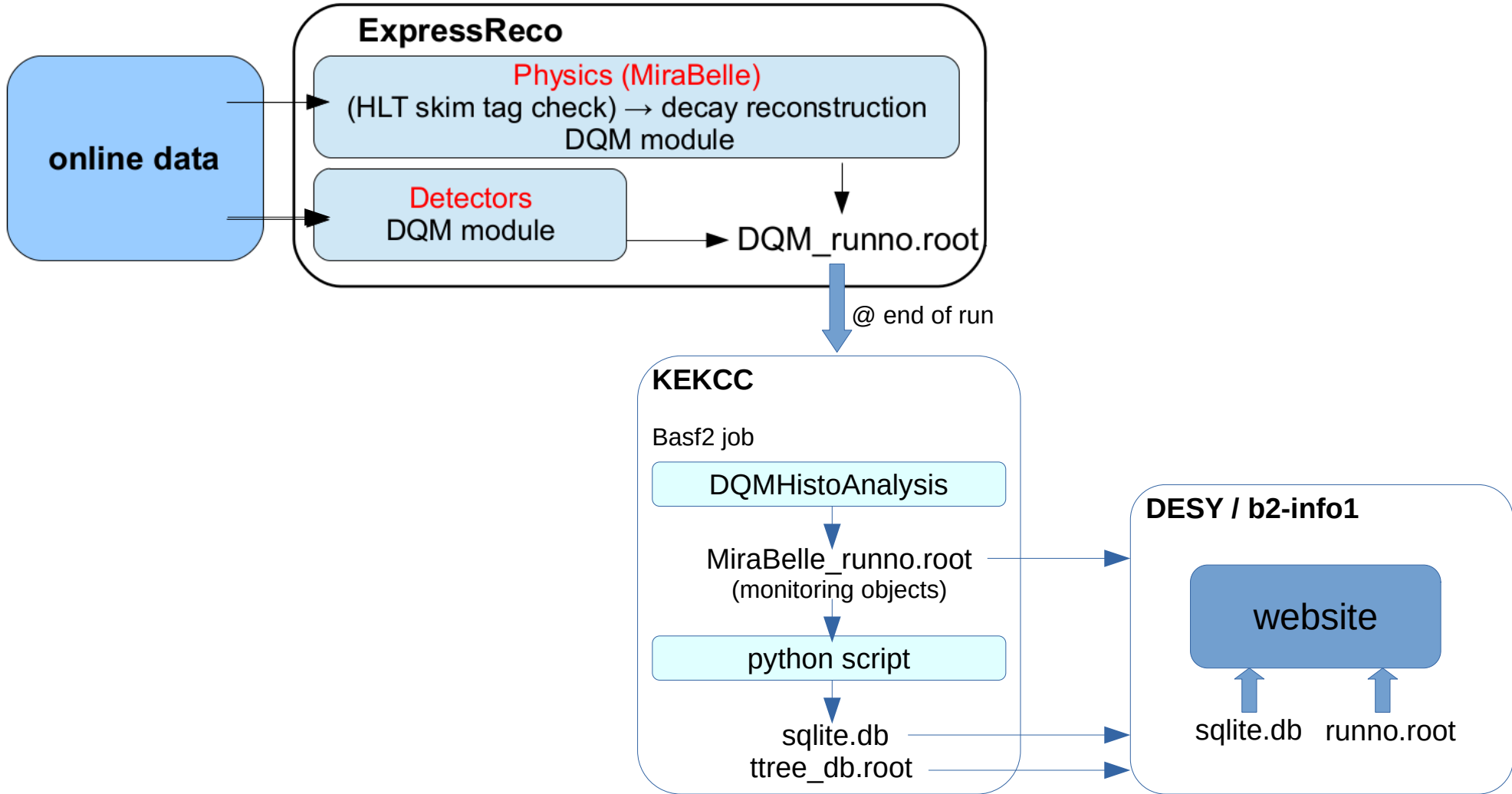
→ possibility of processing full HLT skims on ERECO will greatly enhance the available statistics

→ improve existing MonitoringObjects (additional observables, optimize charts arrangement)

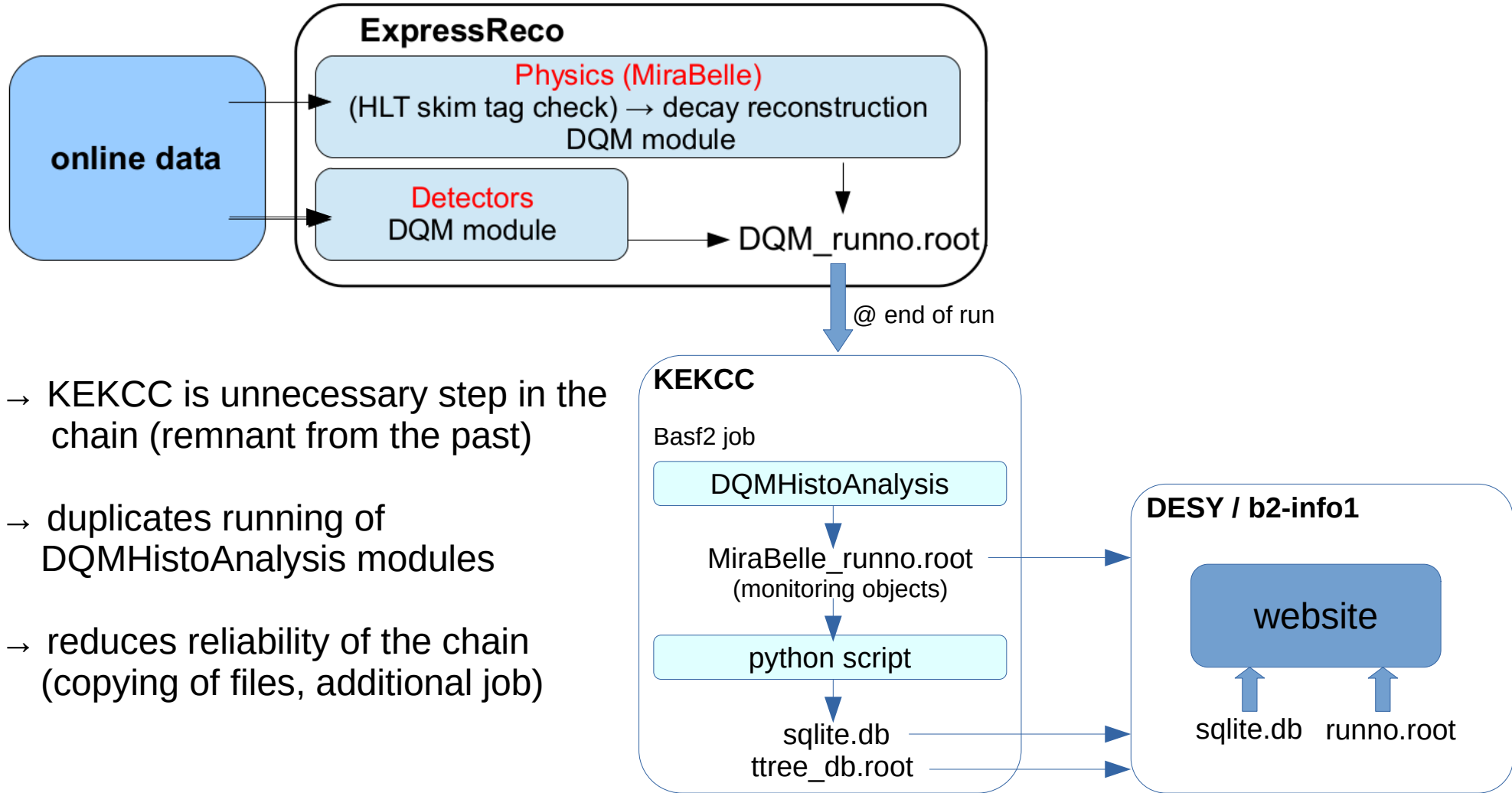
→ smaller functionality updates (e.g. point errors, smaller bug fixes)

**MiraBelle background**

## So far used MiraBelle scheme



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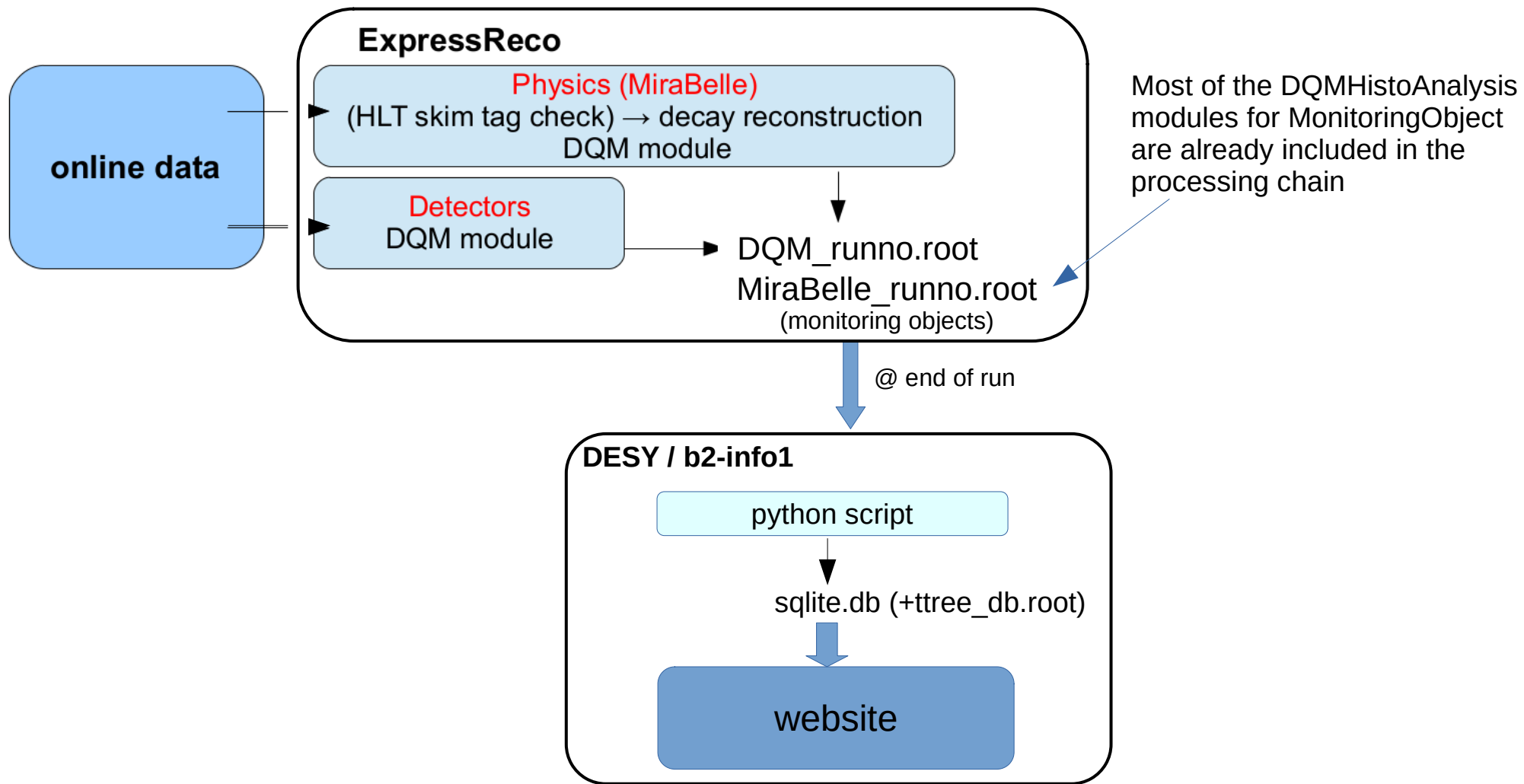


→ KEKCC is unnecessary step in the chain (remnant from the past)

→ duplicates running of DQM Histo Analysis modules

→ reduces reliability of the chain (copying of files, additional job)

## Scheme to be implemented during LS1





- two options: → producing dedicated mirabelle output file
- appending MonitoringObjects to the DQM histograms file



more reliable option

- MonitoringObjects add ~2.5 MB of data (presently DQM histogram files have 15-20 MB)
- both options tested locally
- proper full scale test during LS1: how?
- options for the “intra-run” updates are under consideration
  - update MonitoringObject during the run + copying updated files desy
  - + or use html server
  - (as for the interactive histograms at [dqm.belle2.org](http://dqm.belle2.org))
- considerations of MiraBelle scalability: → with more and more data being added (also monitoring of offline processed data) we should consider moving sqlite DB to a “real” database server

**Additional material for users**

## Adding new data to MiraBelle

- monitoring object can be anything for what run-dependency monitoring is of interest
- nominally the input data is obtained by processing of DQM histograms, but alternatives are possible (like for the RunReg)
- to add new monitoring object
  - if needed (for physics) new hlt\_skim
  - DQM module to fill in the histograms (if not already available)
  - DQM hist analysis module → store values to the MonitoringObject
  - arrange charts for the the website

Manual and example is available at

<https://confluence.desy.de/display/BI/MiraBelle+on+the+online+system>

# Example of implementation

- let's say a DQM histogram "TOP/digitsPerEvent" exists
- let's add the mean number of digits/event in a given run to MiraBelle

## Basf2

### DQMHistAnalysisTOPModule.cc

```
void DQMHistAnalysisTOPMonObjModule::initialize()
{
    // make monitoring object related to this module
    m_monObj = getMonitoringObject("top");
}

void DQMHistAnalysisTOPMonObjModule::endRun()
{
    // get existing histograms produced by DQM modules
    TH1* digits = findHist("TOP/digitsPerEvent");

    // set values of monitoring variables
    m_monObj->setVariable("digitsPerEvent", digits->GetMean());
}
```

## b2monitoring repository

### [top/charts.js](#)

```
var config = {
    numOfRuns: 100,
    defaultCut: "ntrg > 100 and runtime > 500 and rtype == \"physics\"",
    filePrefix: "mon",
    tables: ['top']
};

var collections = ["main"];

var charts = [{
    title: "Number of TOP digits",
    subtitle: "Number TOP digits per event",
    collection: "main",
    series: [{
        variable: "digitsPerEvent",
        name: 'TOP digits',
        type: 'line',
        color: colors[2],
        fillOpacity: 0.3
    }],
    yAxis: [{ title: {
        text: '# of digits',
        style : {'color': colors[1]}
    }}]
}];
```

→ On the webpage source a single line to add TOP button is needed (now already there)

and the following appears

Belle II QAM - MiraBelle RunReg ARICH PXD SVD TOP ECL KLM CDC HLT Event T0 Tracking physics TTree Manual

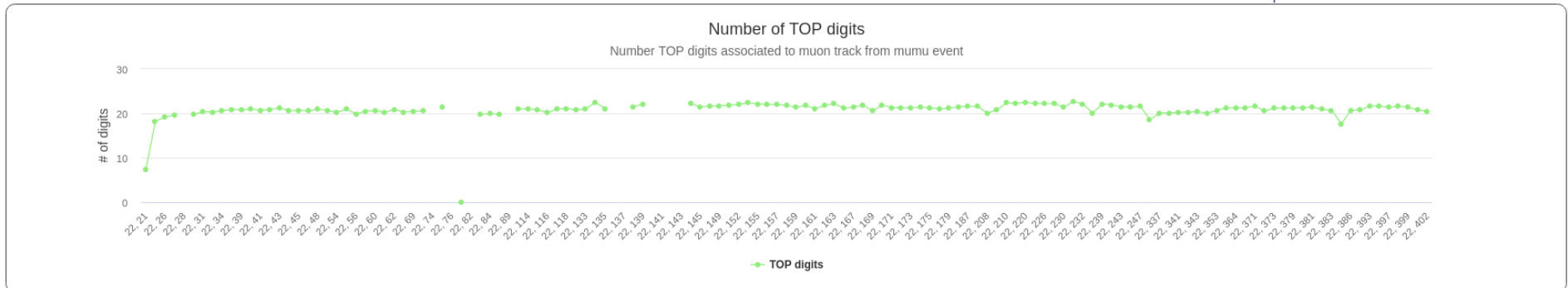
Run selection (press redraw if changed)

Start exp  Start run  End exp  End run  Additional criteria  redraw

Source:  online  mc14rd  proc13

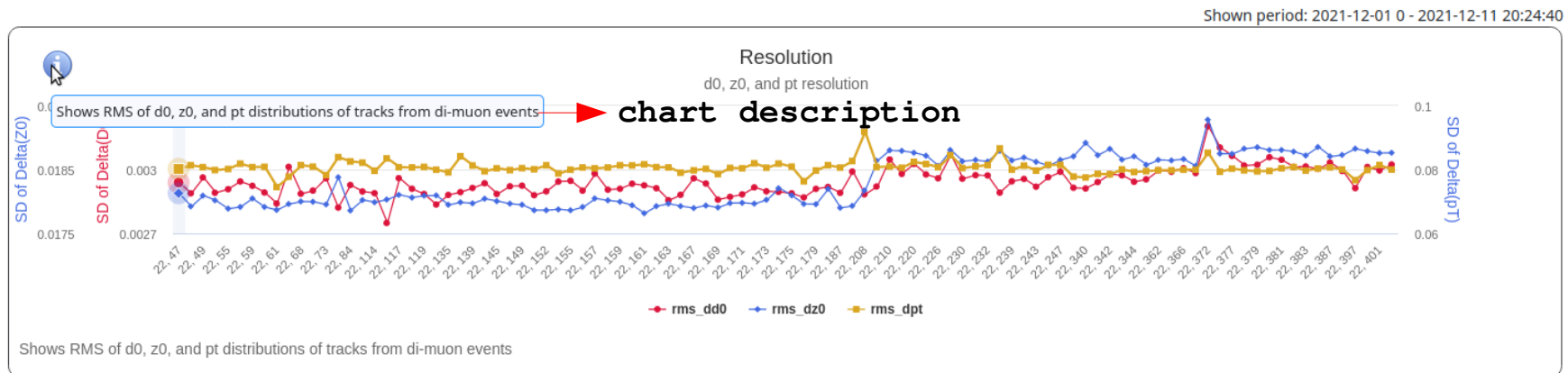
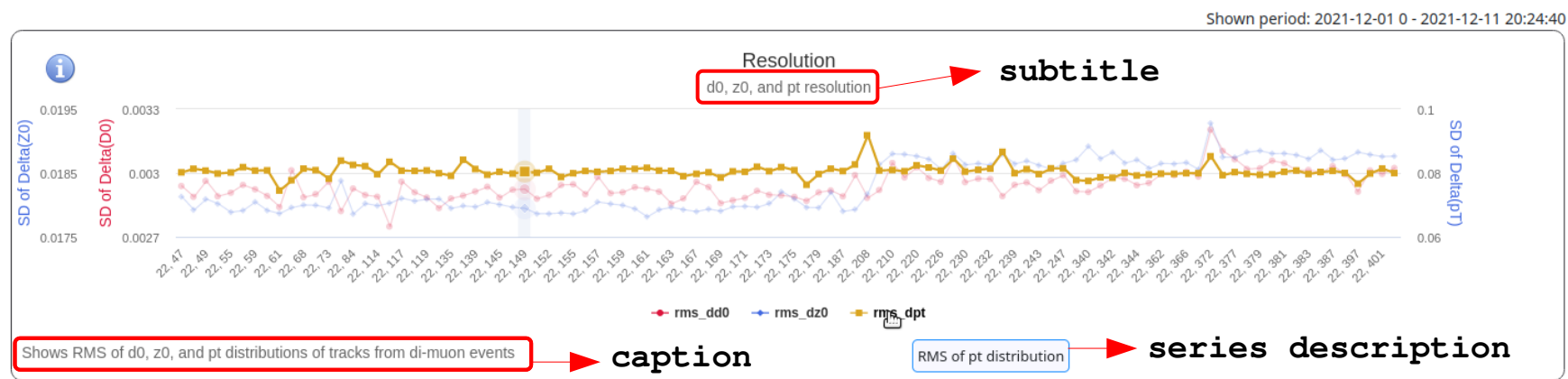
main

Shown period: 2021-11-29 22:11:08 - 2021-12-11 20:24:40



# Help users to understand what is shown on the charts

→ for new and existing charts please add more information on what is shown



- easy to add in your chart config file

```
var charts = [  
  // ===== Resolution  
  {  
    title: "Resolution",  
    subtitle: "d0, z0, and pt resolution",  
    description: "Shows RMS of d0, z0, and pt distributions of tracks from di-muon events",  
    caption: "Shows RMS of d0, z0, and pt distributions of tracks from di-muon events",  
    collection: "mumu",  
    series: [{  
      variable: 'rms_dd0',  
      type: 'line',  
      color: my_colors[1],  
      fillOpacity: 0.3,  
      description: "RMS of d0 distribution"  
    }, {  
      variable: 'rms_dz0',  
      type: 'line',  
      yAxis: 1,  
      color: my_colors[2],  
      fillOpacity: 0.3,  
      description: "RMS of z0 distribution"  
    }  
  ]  
}
```

# Export data from MiraBelle

→ CSV button will export the displayed table to the .csv file

exp	run	date	rtype	ler_current	ler_beam_size_y
18	2401	2021-06-18 09:25:06	physics	824.7	238.2
18	2399	2021-06-18 08:18:15	physics	829.2	236.7

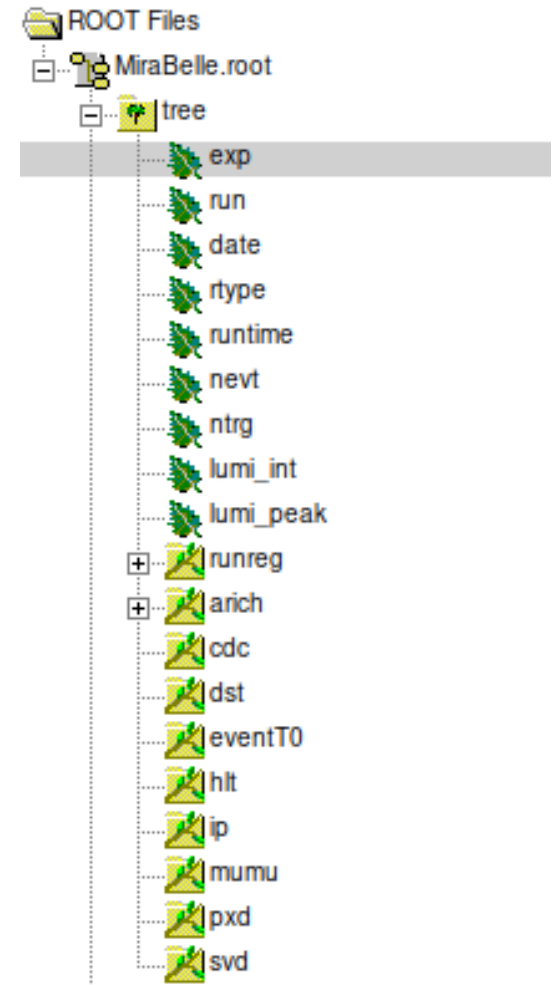
→ you can get the full sqlite database file at

<https://mirabelle.belle2.org/data/data.db>  
(some manual of how to read in python will be prepared)

→ you can root TTree file under the TTree button

→ explore arbitrary correlations, make your own plots

## MiraBelle TTree





## Comments for developers and users

### Code updates

- if you update your DQMHistAnalysis Module include me in PR and the changes can be deployed immediately after merge.
  - you can add new variables to monitoring object any time and they will be available on the website for the runs from the update on. For older runs variables will only become available after “reprocessing” which will be done few times per experiment...
- if you update DQM Module itself changes will take place only when they become part of release running on the online system.
- for changes in the website charts configuration file (charts.js) open PR to “b2monitoring” repository (let me know if you need permissions).

# Comments for developers and users

## Usage of variables in your monitoring object tab

→ when monitoring object tab is clicked the following data is read from the DB

all variables of that monitoring object + run list variables

→ run list variables are (taken from the run registry):

exp	– experiment number
run	– run number
date	– date
rtype	– run type (physics, cosmics,...)
runtime	– run time in seconds
nevt	– Total Events Stored
ntrg	– Number of distributed triggers (preferred wrt. nevt, due to nevt delay)
lumi_int	– run integrated luminosity
lumi_peak	– run peak luminosity

→ on tab charts you can use any of the loaded variables (monitoring object + run list)

→ any of these variables can be used for the run selection (e.g. `rtype == "physics" and lumi_int>0.01`)

→ you can add/subtract/divide/multiply variables. Example:

```
variable: 'effCS_gamma_gamma*ntrg/lumi_int/1e6/n_l1',  
name: 'gamma_gamma',
```

→ in principle it is possible to use also variables from other monitoring objects. SVD example:

```
var config = {  
  numOfRuns: 100, // number of runs to be shown on run dependency graphs (last 100 for example)  
  defaultCut: "ntrg > 100 and runtime > 500 and rtype == \"physics\"", // default run selection, any variable from table can be used  
  filePrefix: "mon",  
  tables: ['svd', 'runreg']  
};
```

→ runreg variables can be used under the SVD tab.

note that this might slow down data transfer since more data is searched and transferred  
(sorry no benchmarking was done...)