Modification of simulation, reconstruction and quality assurance modules of the BmnRoot software

S.A.Nemnyugin, S.P.Merts, V.A.Roudnev, M.M.Stepanova,

K.I.Mashitsin, A.A.Yufryakova

Saint-Petersburg State University

Joint Institute for Nuclear Research

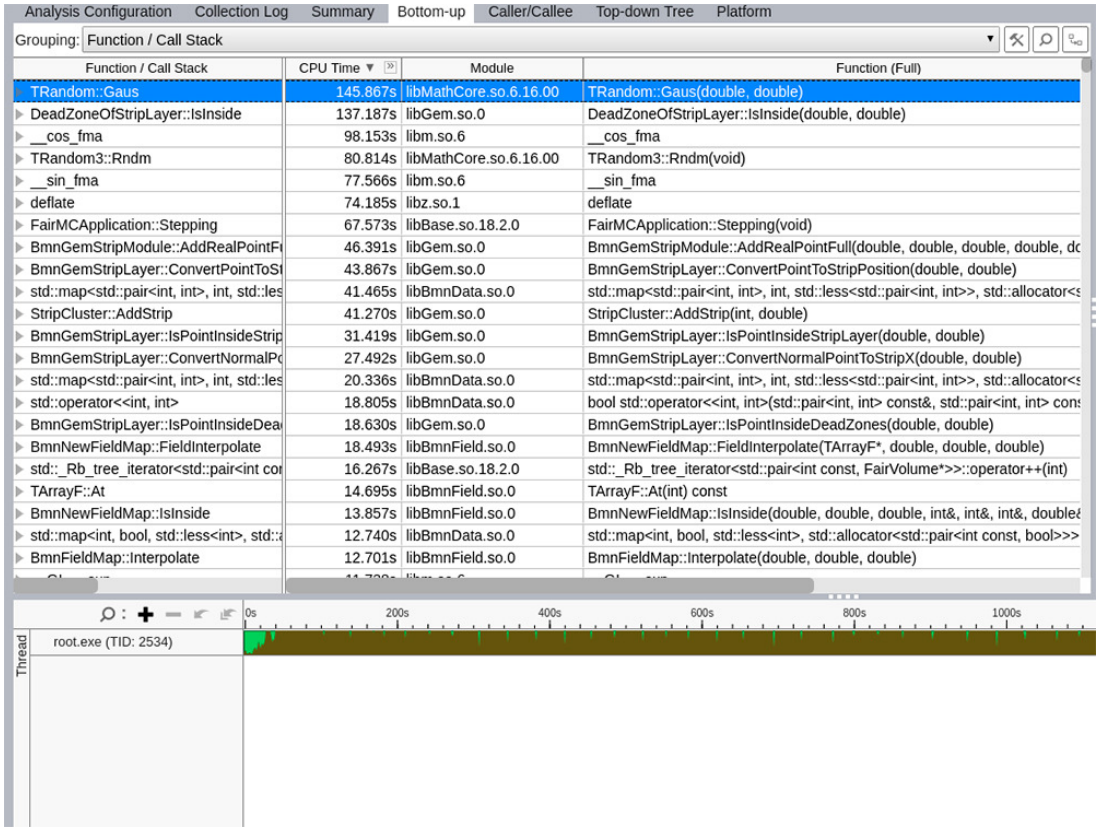
5th Collaboration Meeting of the BM@N Experiment at the NICA Facility. 20-21 April 2020. VBLHEP

Outline

1. Optimization of simulation and new version of reconstruction in BmnRoot.
2. First experience with PROOF.
3. QA porting on JSROOT.

Optimization of simulation and new version of reconstruction in BmnRoot

Analysis and parallelization of simulation

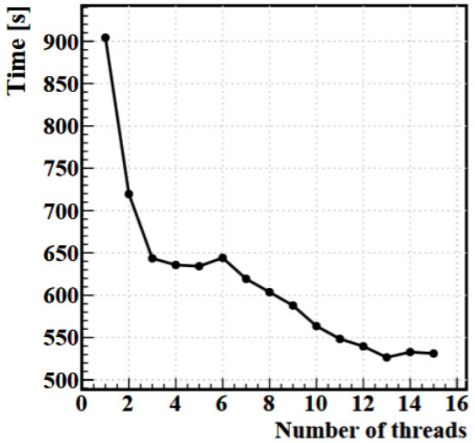


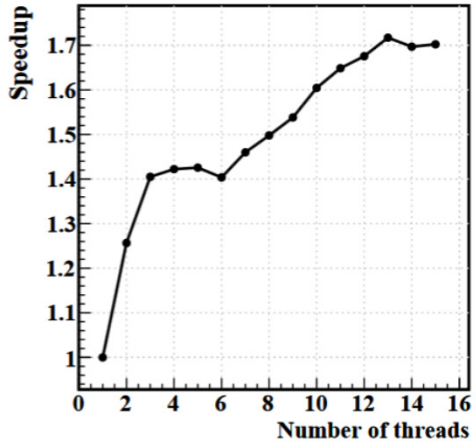
Dynamic analysis displays hotspots of the BmnRoot simulation modules.

OpenMP parallelization. DGSM generator, 1000 events. Testbench: IntelXeonE-2136 @ 4.5GHzTurbo (6 cores with HT). RAM: 32 Gigabytes. OS: Ubuntu. Not committed to git.

`bmnroot/gem/BmnGemStripDigitizer.cxx`

```
void BmnGemStripDigitizer::ProcessMCPoints()
{
FairMCPoint* GemStripPoint;
Int_t NNotPrimaries = 0;
#pragma omp parallel
#pragma omp for schedule(dynamic)
for (UInt_t ipoint = 0; ipoint <
fBmnGemStripPointsArray->GetEntriesFast();
ipoint++)
{
…
```

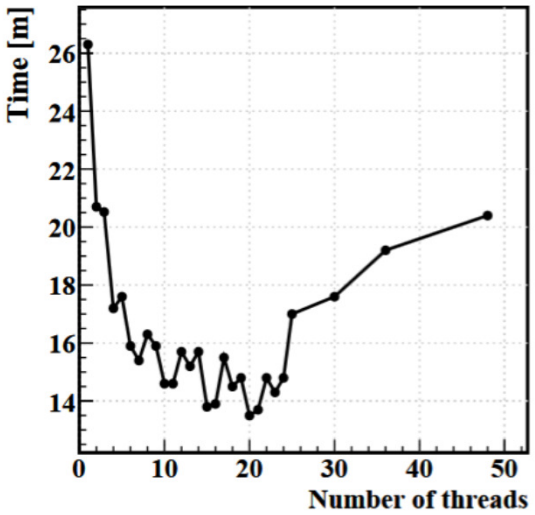


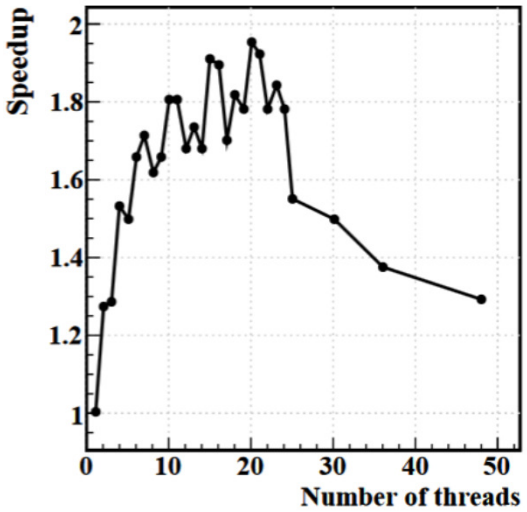


Analysis and parallelization of reconstruction

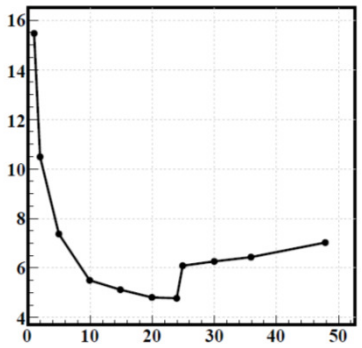
OpenMP parallelization. Reconstruction. 10000 events. Experimental data. Testbench Intel Xeon CPU E5-2650 v3 @ 2.30 GHz chips (24 cores, no hyperthreading), 128 GB of RAM, 4 x GK110BGL, OS Debian 10.2. Commited to git.

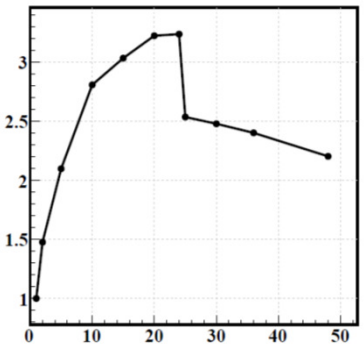
`bmnroot/gem/BmnCellAutotracking.cxx`

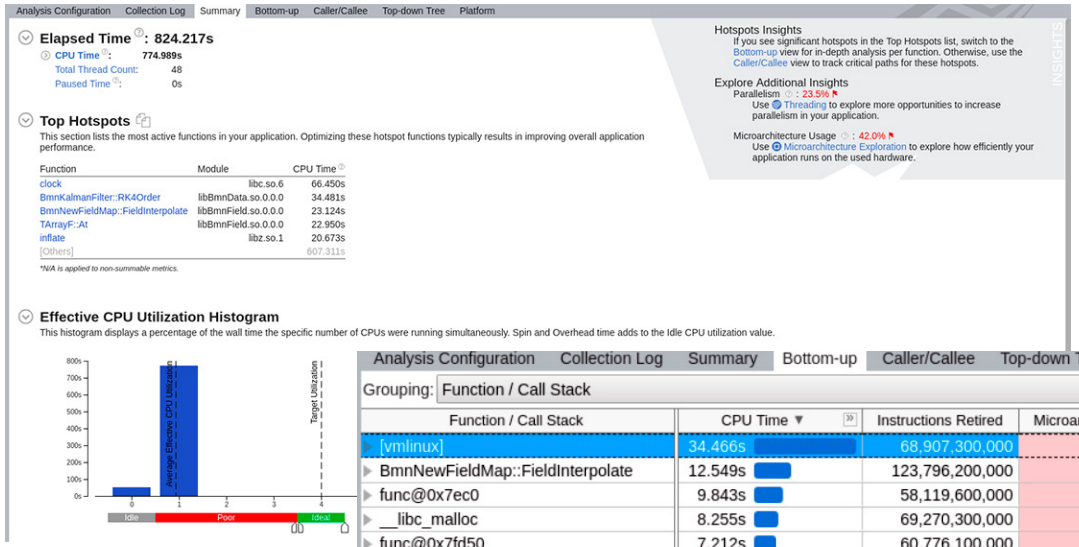




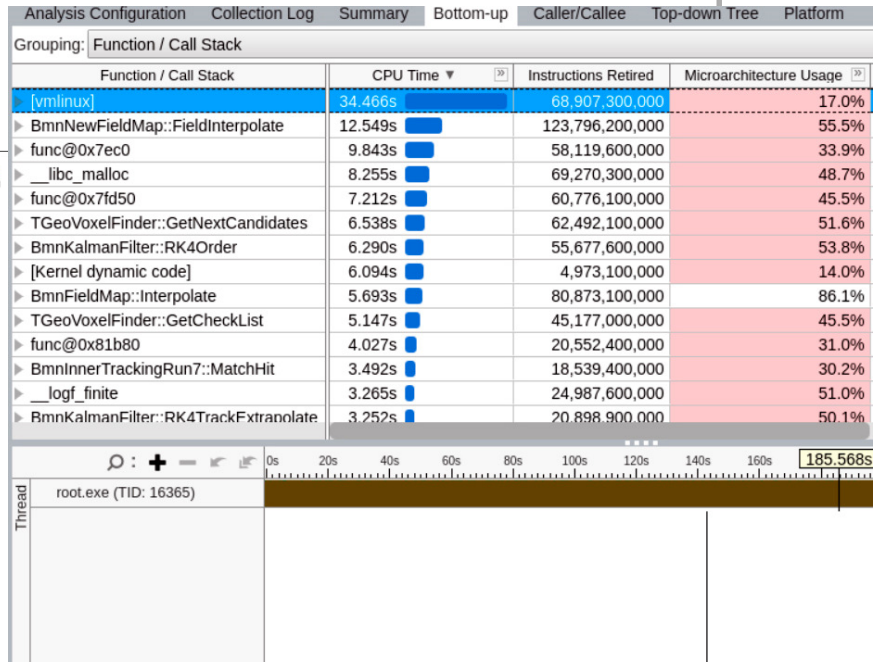
200000 events

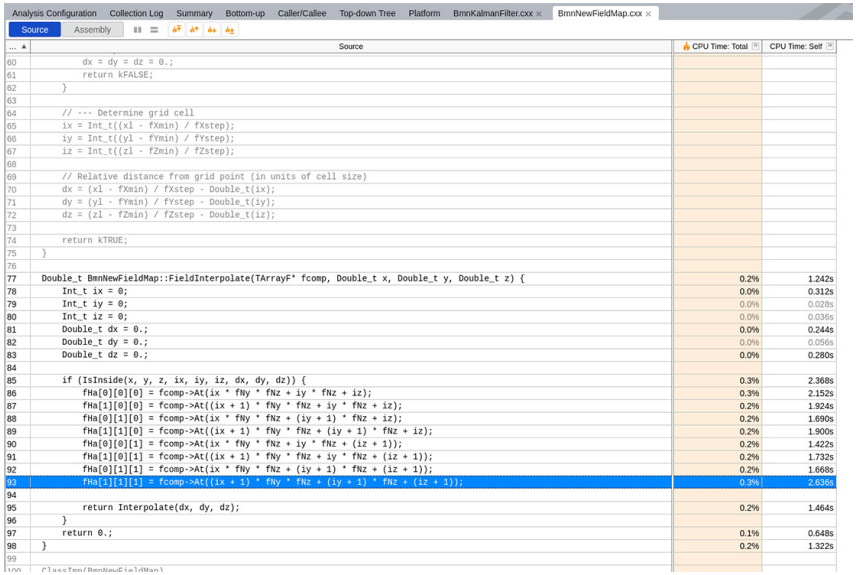






Dynamic analysis displays hotspots of the BmnRoot reconstruction modules.
Optimization is in progress.



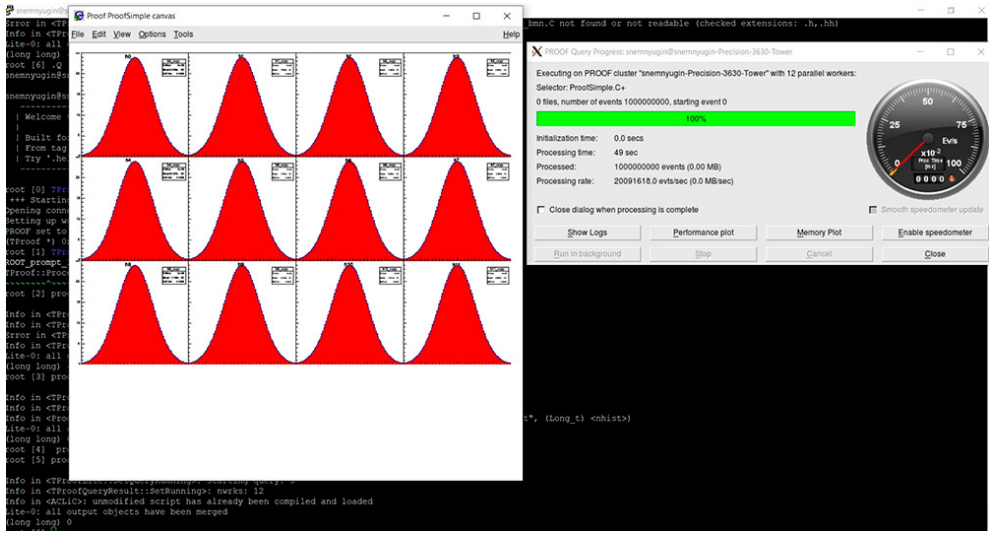


First experience with PROOF

PROOF (Parallel ROOT) – distributed parallel analysis framework based on ROOT.

PROOF-Lite is a version of PROOF optimized for multicore desktops and laptops.

In progress.



QA porting on JSROOT

Development and implementation of modified version of QA (Quality Assurance).

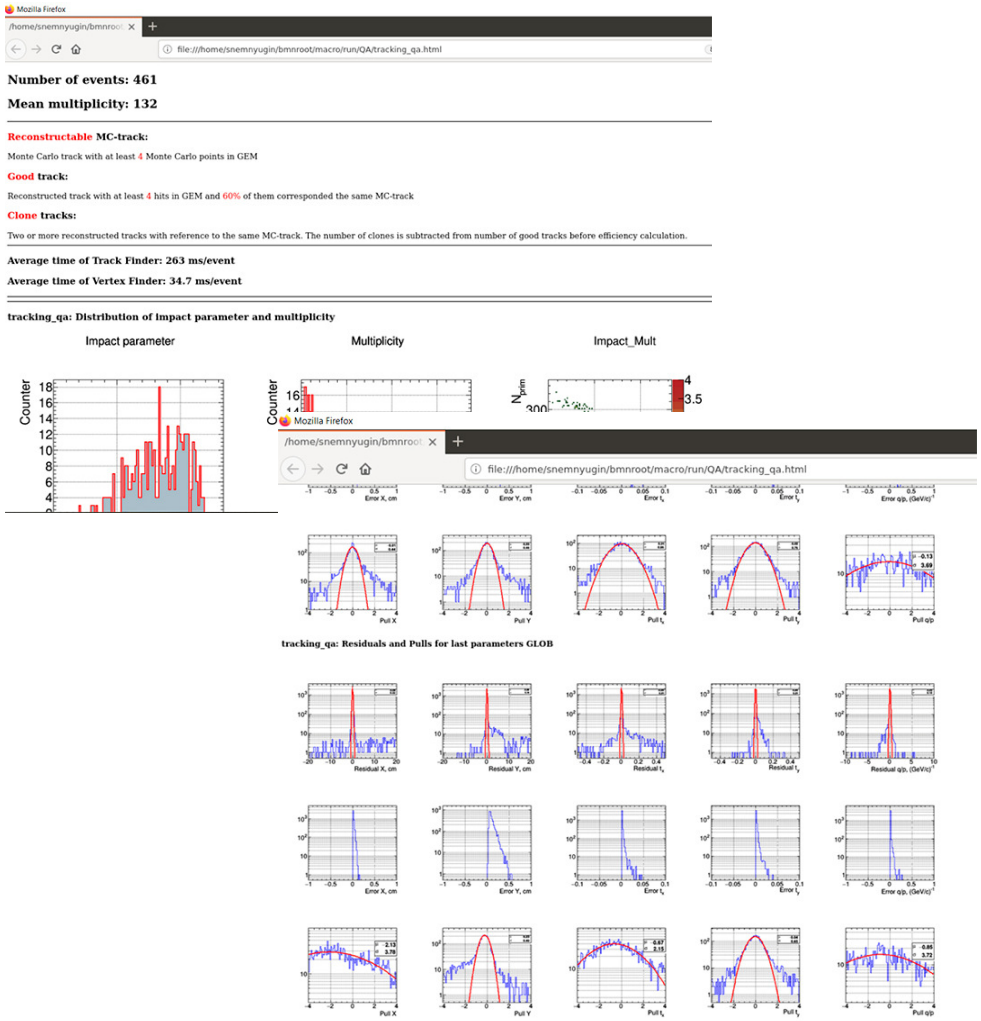
Previous version of QA is based on static html-pages.

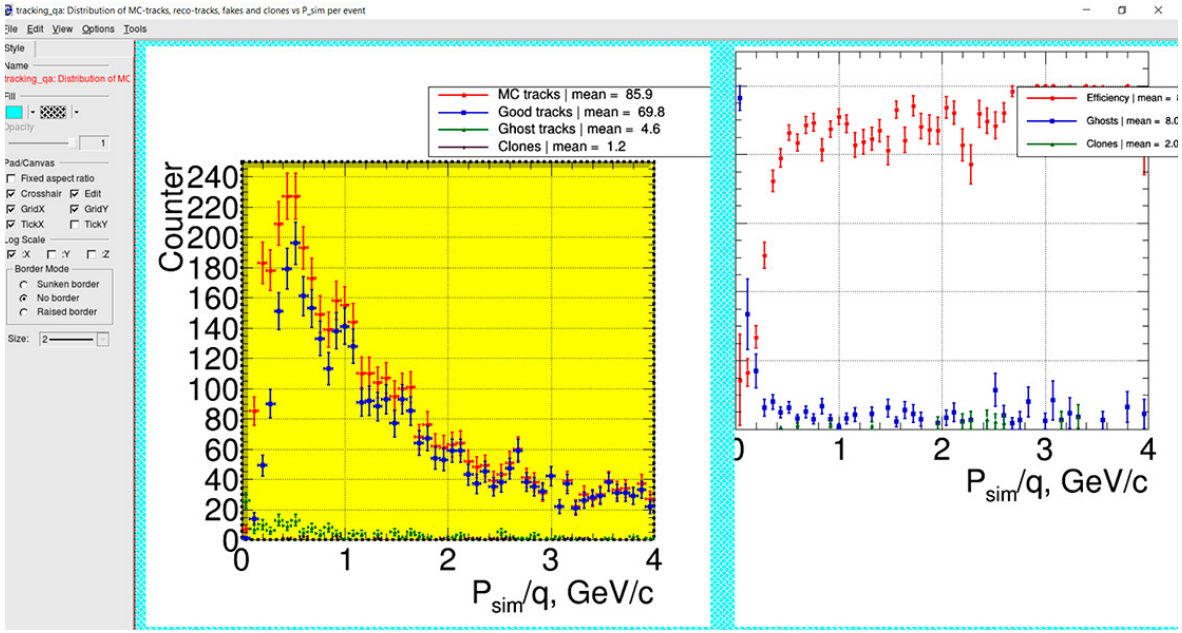
New version is based on more functional and convenient JSROOT.

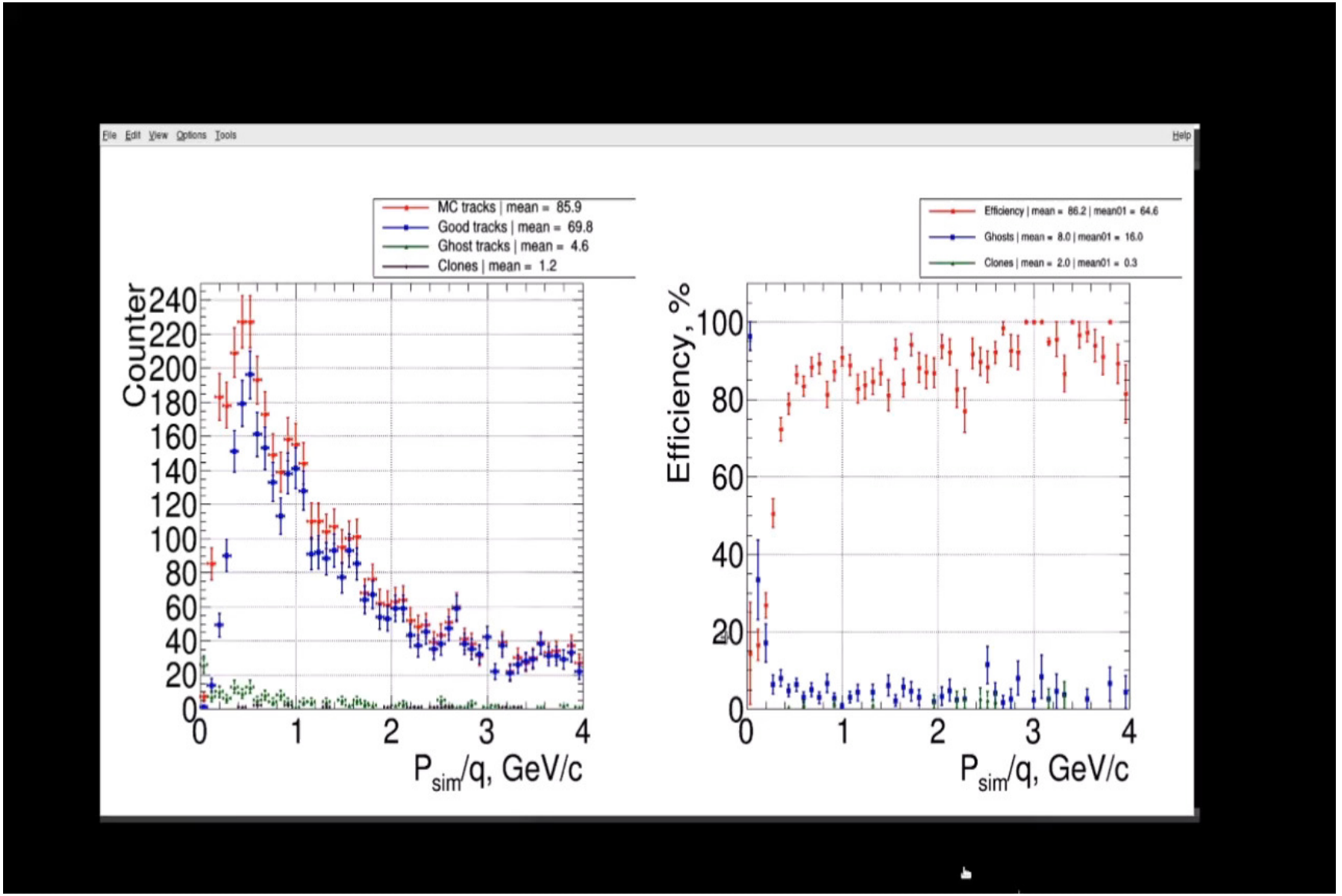
JSROOT (JavaScript ROOT). The JSROOT project intends to implement ROOT graphics for web browsers. Reading of binary ROOT files is supported. Successor of the JSRootIO project.

Source and short User Guide are available.

Committed to git.




tracking_qa: Distribution of MC-tracks, reco-tracks, fakes and clones vs P_sim per event
File Edit View Options Tools
MC tracks | mean = 85.9
Good tracks | mean = 69.8
Ghost tracks | mean = 4.6
Clones | mean = 1.2
Counter
P_{sim}/q, GeV/c
Efficiency | mean =
Ghosts | mean = 8.0
Clones | mean = 2.0
P_{sim}/q, GeV/c


File Edit View Options Tools
Help
MC tracks | mean = 85.9
Good tracks | mean = 69.8
Ghost tracks | mean = 4.6
Clones | mean = 1.2
Counter
P_{sim}/q, GeV/c
Efficiency | mean = 86.2 | mean01 = 64.6
Ghosts | mean = 8.0 | mean01 = 16.0
Clones | mean = 2.0 | mean01 = 0.3
Efficiency, %
P_{sim}/q, GeV/c

Thank you for attention!

Sergei Nemnyugin

snemnyugin@mail.ru